

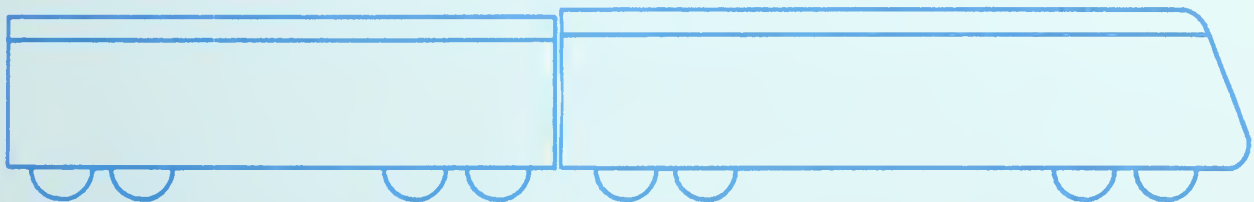
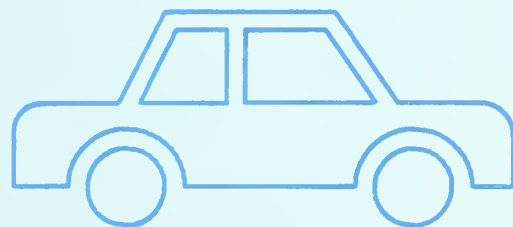
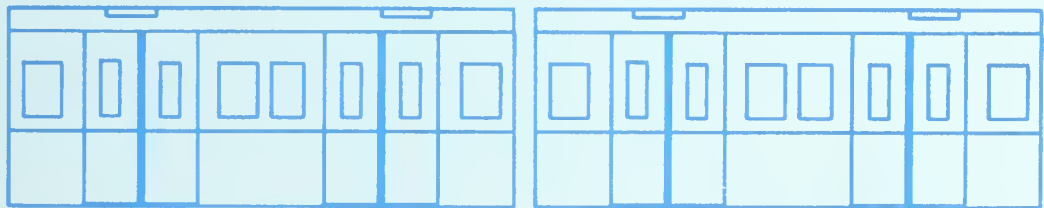


U.S. Department of
Transportation

Characteristics of Urban Transportation Demand

An Update

July 1988



Characterisitcs of Urban Transportation Demand

An Update

Revised Edition
July 1988

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Distributed in Cooperation with
Technology Sharing Program
U.S. Department of Transportation

DOT-T-88-18

1. Report No. DOT-T-88-18	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle CHARACTERISTICS OF URBAN TRANSPORTATION DEMAND: AN UPDATE		5. Report Date July 1988	
		6. Performing Organization Code	
		8. Performing Organization Report No. 784.01	
7. Author(s)		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Charles River Associates Incorporated* 200 Clarendon Street Boston, Massachusetts 02116		11. Contract or Grant No. DTUM60-84-C-71262	
		13. Type of Report and Period Covered Final Report** 1984-1987	
12. Sponsoring Agency Name and Address Urban Mass Transportation Administration 400 7th Street, SW Washington, DC 20590		14. Sponsoring Agency Code	
15. Supplementary Notes * With assistance from Herbert S. Levinson ** This report supercedes an earlier draft dated April 1986 (PB88-166905/WTS)			
16. Abstract This report presents a selection of updated data on a wide variety of statistics pertaining to urban travel demand. The information supplements earlier data contained in the UMTA handbook, Characteristics of Urban Transportation Demand -- A Handbook for Transit Planners . The report is designed to be used by transportation analysts as a source of data to check the validity and reasonableness of local forecasts developed from traditional planning studies, or as a cross-check on the similarity of travel statistics from one locality to another. Certain data also may be used as default values for modeling purposes, when such information is not available locally or would require new or extensive data collection efforts. Much of the information presented was obtained from reports, documents, and memoranda produced by or for each study area contacted. A main criterion of the study was that the information collected be based on surveys, measurements, counts, and so forth, and not be synthesized results from analytical modeling efforts. Many source documents have not been circulated widely, adding to the usefulness of the data contained in this report.			
17. Key Words Urban Transportation Demand, Trip Generation, Trip Length, Mode Choice, Auto Occupancy, Truck Travel, Transit Usage, Highway and HOV Usage, Trip Purpose		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia, 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 121	22. Price

ACKNOWLEDGMENTS

This report, Characteristics of Urban Transportation Demand: An Update, was prepared in the Boston, Massachusetts office of Charles River Associates Incorporated (CRA) for the Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation (DOT) under Contract Number DTUM60-84-C-71262. Within CRA, Thomas E. Parody served as project manager and had primary responsibility for the overall direction of the study including data collection and synthesis. Other individuals at CRA assisting in this effort included Daniel Krechmer, Marty Liss, and Ellen Sokoll. Mr. Herbert S. Levinson contributed input and guidance at key points throughout the course of the project and also participated in updating various travel demand factors. The efforts of all these individuals were supervised by Daniel Brand, CRA's Officer-in-Charge, who also provided useful suggestions and insights throughout the study.

The authors would like to thank as well as acknowledge the guidance and assistance provided by Sam Zimmerman and Joe Ossi of UMTA who served as Technical Managers for this study. Although CRA accepts responsibility for the information and contents presented in this report, our work would not have been possible without the cooperation of many individuals and agencies who responded to our data requests. The authors wish to thank them once again for their help.

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INTRODUCTION

This report presents a comprehensive set of updated and reorganized data on a wide variety of statistics related to urban travel demand characteristics. Comparable information on travel characteristics was originally contained in the handbook by Herbert S. Levinson entitled Characteristics of Urban Transportation Demand -- A Handbook for Transportation Planners ("CUTD"), released by the Urban Mass Transportation Administration (UMTA) in April 1978. The original handbook drew heavily from facts contained in the comprehensive, large-scale, Urban Transportation Planning studies that were conducted in many localities during the 1950s and 1960s. While providing a very rich source of data that has not been duplicated since, the information contained in these studies generally reflects travel behavior prior to 1970.

Since the time of those earlier studies many changes have occurred in the nation's transportation system (e.g., fuel prices, transit retrenchment and expansion) and in the sociodemographic characteristics of both travelers and households (e.g., household sizes have generally declined over time and the availability of autos has continued to increase). This update to the CUTD handbook presents a compilation almost exclusively of post-1970 data on travel demand. It is designed to be used by transportation planners and analysts as a source of data to check the validity and reasonableness of local forecasts using either conventional or emerging planning/modeling techniques, or as a cross-check on the similarity of travel statistics from one locality to another. Certain data may also be used as default values for modeling purposes if such information is not available locally, or would require new or extensive data collection efforts. Another use of this report would be to examine how key statistics have changed over time and to transfer these changes from one area to another. To assist in this effort, and to help those who would like to compare the information in this update to the same types of data in the 1978 CUTD handbook, a key that matches the tables between the two reports is presented at the end of this introductory section.

In addition to the 1978 edition of CUTD (PB-293220/LP), its Appendix (PB-294989/LP), and this updated report, two sister publications have been released by UMTA and the Federal Highway Administration (FHWA) as guides to assist in transportation planning and analysis activities. The first report entitled Characteristics of Urban Transportation Systems: Sixth Edition (CUTS), October 1985 (PB86-126810/WTS), provides a wealth of data on transportation supply characteristics (speed, capacity, labor requirements, operating and capital costs, energy consumption, pollution, and accident frequency) for five urban transportation modes. The second publication in this series by Barton-Aschman Associates and R.H. Pratt & Co., entitled Traveler Response to Transportation System Changes, second edition, July 1981 (PB82-129453), presents capsule summaries of how travelers have responded to particular changes that have been made to the transportation system categorized by many types of changes that have occurred and the related impacts that have been observed. The publications listed above are meant to provide quick access to transportation demand, supply, and cause-and-effect data in a readily summarized fashion.

Data Sources

Since 1970, very few urban areas have conducted comprehensive transportation studies of the type undertaken in the 1950s and 1960s. Many areas, however, have conducted small-scale data collection efforts either to update earlier data (for model validation purposes) or for some specialized, rather than area-wide, planning purposes. As might be expected, those localities that do have available more recent data on travel demand statistics tend to be the larger metropolitan areas that are able to support an ongoing transportation planning staff. Thus, not as much updated travel demand data are available for small- to medium-sized urban areas compared to the 1978 CUTD handbook.

Much of the information contained in the foregoing tables was obtained from reports, documents, memoranda etc. produced by or for each study area contacted. A main criterion was that the information collected be based on surveys, measurements, counts, etc. and not be synthesized results from analytical modeling efforts. (Still there can be no guarantee that some of the latter have not made their way into the handbook.) Many of these source documents have not been circulated widely, which should add to the usefulness of the tables. In those instances in which a limited number of sources was used to compute the information in a particular table, the source(s) has been listed.

One objective of this report was to summarize useful travel demand statistics that may not be readily available elsewhere. Therefore, little information has been reproduced herein from many other widely circulated, but potentially relevant publications. Examples of these types of publications that may supplement the information contained in this report include:

1. Transportation Research Board, Highway Capacity Manual, Special Report 209, 1985.
2. Institute of Transportation Engineers, Transportation and Traffic Engineering Handbook, second edition, Prentice-Hall (Englewood Cliffs, N.J.), 1982.
3. Institute of Transportation Engineers, Trip Generation, fourth edition, 1987.
4. Institute of Transportation Engineers, Parking Generation, second edition, 1987.
5. Arthur Sosslau et al., Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, National Cooperative Highway Research Program Report 187, 1978.
6. Herbert S. Levinson et al., Bus Use of Highways: State of the Art, National Cooperative Highway Research Program Report 143, 1973.
7. U.S. Bureau of the Census, 1980 Census of Population, Vol. 2, Journey to Work: Characteristics of Workers in Metropolitan Areas, PC80-2-6D, July 1984.
8. Federal Highway Administration, Transportation Planning Data for Urbanized Areas Based on the 1980 Census, DOT-I-85-20, January 1985.
9. Federal Highway Administration, Journey-To-Work Trends Based on 1960, 1970, and 1980 Decennial Censuses, July 1986.
10. Reports produced from the "Nationwide Personal Transportation Study." (Reports are available from the 1969, 1977, and 1983/84 survey.)

Organization and Use of this Report

As an aid in using this report, the tables have been grouped into nine sections that are organized in a sequence consistent with the traditional 3-C planning process. The sections are:

- A. Socioeconomic Characteristics for Study Areas,
- B. Trip Generation: Person and Vehicle Trips,
- C. Trip Length and VMT Data,
- D. Mode Choice and Auto Occupancies,
- E. Temporal Distribution of Travel,
- F. CBD Characteristics and Travel Statistics,
- G. Truck Travel,
- H. Transit Usage Statistics, and
- I. Highway and HOV Usage Statistics.

Section A contains data on population, land areas and densities for cities, urbanized areas and Standard Metropolitan Statistical Areas (SMSAs) along with vehicle availability statistics from the 1980 Census for major urbanized areas in the United States. Users should refer to this information in order to determine which other cities are most comparable to their own locality along the dimensions of area, density, and vehicle availability. Vehicle availability can be viewed as a proxy for the amount of transit available and/or the relative income level of the study population. The attractiveness of the data in Tables A-1 and A-2 is that the geographical boundaries are defined according to a consistent set of Census definitions. This is rarely the case for the geographical areas used in local planning studies.

Once one or more comparable cities have been identified, the user should refer next to Table A-3 which presents key socioeconomic statistics about many of the study areas for which data are presented in subsequent tables. In particular, Table A-3 identifies for these study areas: 1) the year the information was collected, 2) the size (i.e., population) or boundaries for the study area examined, and 3) socioeconomic characteristics of the study area. Generally, information on study areas from this table can then be matched with information on study areas in any other table for which the study area name, year, and study area description are the same. (Note that some exceptions are possible, however.)

In addition to the factors discussed above, certain travel demand data can be expected to change over time. Even though the inclusion of data from before 1970 has been minimized, there is a time span of at least 15 years between the earliest and

latest entries. An even longer time span exists if comparisons are made to data contained in the 1978 edition of the handbook. Consequently to assist users in transferring data between two points in time, Table 1 presents how certain underlying socioeconomic characteristics have changed between 1960, 1970, and 1980 based on the U.S. Census. For example, it is evident that the work force has expanded as a result of population growth and the increase in the number of women who work outside the home. Automobile ownership levels have increased, bringing about increases in the percentage of the commuter trips made by automobile at the expense of mass transit modes. Understanding the implications of these types of trends for travel demand should assist users of this report in examining (or transferring) data between different points in time.

Certain tables also present summary statistics on average nationwide travel demand characteristics from the 1969, 1977, and 1983/4 NPTS reports. These statistics are most useful in highlighting how a given travel factor may have changed over time. The NPTS results can also be used as a reference point to determine how similar factors from a particular study area compare to a nationwide estimate. Users should note, however, that differences in definitions, questionnaire designs, and the relatively small sample sizes associated with the 1983/4 NPTS may not always yield a true comparison.

Use of the Data and Other Cautions

Nearly all the travel demand data contained in this report postdates 1970; thus a large amount of older data from the 1978 CUTD handbook has not been included here. The one exception is statistics related to truck travel. Very little new data on this subject have been collected since the publication of the 1978 CUTD handbook. As suggested earlier, individuals interested in the temporal (in)stability of particular travel demand components may use the cross-reference index (Table 2) to locate and compare, where possible, data contained in this versus the 1978 CUTD handbook. One note of caution, however, is that differences in study area boundaries and the definitions of terms can easily obscure a true comparison of changes over time. For example, a "person trip," a basic travel demand measure, can be defined variously to include or exclude walk trips, trips made in trucks, trips by individuals less than a certain age (e.g., 5, 12, or 16 years old), to give but a few examples. Trips are typically defined as those taken on an average weekday, although, again, differences in definitions are possible. In addition, as shown in Table B-2 for Chicago, the number of person trips made per household in the City of Chicago compared to the larger SMSA varies considerably because of differences in auto availability, income, and/or household composition. Users should note well how these factors may affect the interpretation of the data.

Table 1

COMPARISON OF TRANSPORTATION PLANNING DATA FOR URBANIZED AREAS
BASED ON THE U.S. CENSUS FOR 1960, 1970, AND 1980

URBANIZED AREA FACTOR	1960	1970	1980
Total number of areas ^a	202	248	366
Total population	91,322,864	118,440,006	139,182,696
Total number of households	28,107,216	37,791,508	50,549,711
Total housing units	29,756,224	39,557,589	53,824,097
Percent renter-occupied housing	43.7	41.1	39.2
Workers as percent of population	38.5	40.3	45.7
Autos per household	1.0	1.2	1.3
Persons per auto	3.3	2.6	2.1
Workers per auto	1.3	1.1	0.9
Persons per household	3.2	3.1	2.8
Workers per household	1.3	1.3	1.3
Percent of workers making work trip by			
Auto ^b	73.4	77.3	83.4 ^b
Rail	8.2	4.9	3.4
Bus	16.4	8.7	6.1
Percent of households with			
0 Autos	25.3	20.1	16.7
1 Auto	54.6	45.5	44.6
2 Autos	17.8	29.0	30.3
3+ Autos	2.3	5.4	8.4

Table continued on following page.

Table 1 (Continued)

COMPARISON OF TRANSPORTATION PLANNING DATA FOR URBANIZED AREAS
BASED ON THE U.S. CENSUS FOR 1960, 1970, AND 1980

URBANIZED AREA FACTOR	1960	1970	1980
Percent of families earning ^c			
Less than \$5,000	32.6	16.1	18.6
\$5,000-7,999	34.0	16.4	27.6
\$8,000-14,999	27.3	42.1	34.5
\$15,000+	6.1	25.4	19.3
Median income	\$6,415	\$10,618	\$21,243

Key to Notes

- a -- Note that the introduction of new urbanized areas over time is likely to alter a true comparison of how factors have changed temporally.
- b -- In 1980 private vehicle includes truck/van (9.6%) and auto (73.8%) to yield 83.4%.
- c -- The 1980 groupings are:
 - Less than \$10,000
 - \$10,000-19,999
 - \$20,000-34,999
 - \$35,000+

SOURCE: Federal Highway Administration, Transportation Planning Data for Urbanized Areas Based on the 1980 Census, DOT-I-85-20, January 1985.

Table 2

KEY TO MATCHING TABLES TO THE 1978
EDITION OF CUTD

<u>CUTD: Update</u>	<u>CUTD: 1978 Edition</u>	<u>CUTD: Update</u>	<u>CUTD: 1978 Edition</u>
A-1	4-1; 4-2; 4-3	F-1	4-1; 4-2; 4-3
A-2	---	F-2	---
A-3	---	F-3	---
B-1	3-1; 3-2	F-4	4-4
B-2	3-3	F-5	4-5
B-3	3-4; 3-6	F-6	---
B-4	3-6	F-7	4-4
B-5	---	F-8	---
B-6	3-7	F-9	---
B-7	---	F-10	4-6
B-8	---	F-11	---
B-9	3-11	F-12	4-3
B-10	3-11	F-13	4-7
B-11	---	F-14	4-7
B-12	---	F-15	4-10
B-13	---	F-16	3-30; 4-11
B-14	---	G-1	3-14
B-15	---	G-2	3-15
B-16	3-12	G-3	3-16
C-1	3-21; 3-24	G-4	3-17
C-2	3-19	G-5	---
C-3	---	G-6	3-29
C-4	3-18; 3-22	G-7	3-31
C-5	3-25	G-8	---
D-1	3-1; 3-2	H-1	5-7
D-2	---	H-2	5-1; 5-2
D-3	---	H-3	5-2
D-4	---	H-4	---
D-5	---	H-5	5-3
D-6	---	H-6	---
D-7	3-13	H-7	---
D-8	3-13	H-8	5-5
D-9	3-13	H-9	5-6
E-1	3-26	H-10	5-9
E-2	3-27	I-1	7-1
E-3	4-8	I-2	7-2
E-4	---	I-3	---
E-5	---	I-4	---
		I-5	---

As a general rule, the numbers presented in the following tables are reported at the same level of accuracy (i.e., in terms of the number of decimal places), but where reports from individual study areas did not give that level of accuracy, fewer decimal places are used. In short, trailing zeros after a decimal point have not been used for the simple purpose of presenting a standardized number of decimal places for any given entry.

A. SOCIOECONOMIC CHARACTERISTICS FOR STUDY AREAS

Table A-1 of this section presents information on basic demographic characteristics (population, land area, density) defined for a consistent set of geographical units (city, urbanized area, SMSA) for localities generally included in subsequent tables of the handbook. The demographic statistics in Table A-1, in combination with the data presented in Table A-2 on vehicle availability, can be used to assess the similarities, and thus potential transferability, of travel demand factors from one study area to another that appear elsewhere in this handbook. Table A-3 summarizes in one place the socioeconomic characteristics for the particular study areas and year(s) for which travel demand data are presented, thereby eliminating the need to repeat this information in each table throughout the handbook.

Table A-1

POPULATION, AREA, AND DENSITIES FOR SELECTED LOCALITIES
THAT ARE INCLUDED IN SUBSEQUENT TABLES (1980)

City Rank	Locality ^a City/U.A./SMSA	Population (000s)			Land Area (Sq. Miles)			Density (Persons/Sq. Mile)		
		City	U.A.	SMSA	City	U.A.	SMSA	City	U.A.	SMSA
29	Atlanta	425	1,613	2,030	131.0	905	4,341	3,244	1,783	468
10	Baltimore	787	1,755	2,174	80.3	523	2,247	9,798	3,357	968
20	Boston	563	2,679	2,763	47.2	857	1,237	11,928	3,126	2,233
34	Buffalo	358	1,002	1,243	41.8	266	1,572	8,561	3,768	791
2	Chicago	3,005	6,780	7,104	228.1	1,498	3,724	13,174	4,526	1,908
32	Cincinnati	385	1,123	1,401	78.1	420	2,139	4,935	2,675	655
18	Cleveland	574	1,752	1,899	79.0	629	1,520	7,264	2,786	1,250
19	Columbus, OH	565	834	1,093	180.9	305	2,462	3,123	2,733	444
7	Dallas/	904	2,451	2,975	333.0	1,280	8,326	2,715	1,915	357
33	Ft. Worth	385	---	---	240.2	---	---	1,604	---	---
70	Dayton	203	595	830	48.4	248	1,709	4,202	2,399	486
24	Denver	492	1,352	1,621	110.6	439	1,646	4,452	3,080	349
6	Detroit	1,203	3,809	4,353	135.6	1,044	3,939	8,874	3,649	1,105
5	Houston	1,595	2,412	2,905	556.4	1,049	6,752	2,867	2,300	430
12	Indianapolis	701	836	1,167	352.0	433	3,077	1,991	1,932	379
27	Kansas City, MO	448	1,098	1,327	316.3	589	3,332	1,417	1,864	398
3	Los Angeles/	2,967	9,479	7,478	464.7	1,827	4,070	6,384	5,189	1,837
37	Long Beach	361	---	---	49.8	---	---	7,256	---	---
49	Louisville	298	761	906	60.0	261	1,402	4,974	2,916	646
41	Miami	347	1,608	1,626	34.3	340	1,955	10,113	4,730	831
16	Milwaukee	636	1,207	1,397	95.8	496	1,461	6,641	2,433	956
34	Minneapolis/	371	1,788	2,114	55.1	980	4,609	6,732	1,824	459
54	St. Paul	270	---	---	52.4	---	---	5,157	---	---
21	New Orleans	558	1,079	1,187	199.4	230	1,907	2,796	4,688	623
1	New York City	7,072	15,590	9,120	301.5	2,808	1,382	23,455	5,552	6,602
---	Manhattan	1,428	---	---	22.2	---	---	64,337	---	---
4	Philadelphia	1,688	4,113	4,717	136.0	1,015	3,522	12,413	4,052	1,336
9	Phoenix	790	1,409	1,509	324.0	641	9,127	2,437	2,199	165
30	Pittsburgh	424	1,810	2,264	55.4	713	3,054	7,652	2,539	741
35	Portland	366	1,026	1,243	103.3	349	3,653	3,547	2,940	340
99	Providence	157	796	919	18.9	282	757	8,297	2,824	1,214
26	St. Louis	453	1,849	2,356	61.4	597	4,968	7,379	3,096	474
11	San Antonio	786	945	1,072	262.7	354	2,516	2,992	2,669	426
8	San Diego	876	1,704	1,862	320.0	611	4,212	2,736	2,789	442
13	San Francisco/	679	3,191	3,251	46.4	796	2,482	14,633	4,008	1,310
43	Oakland	339	---	---	53.9	---	---	6,296	---	---

Table continued on following page.

Table A-1 (Continued)

POPULATION, AREA, AND DENSITIES FOR SELECTED LOCALITIES
THAT ARE INCLUDED IN SUBSEQUENT TABLES (1980)

City Rank	Locality ^a City/U.A./SMSA	Population (000s)			Land Area (Sq. Miles)			Density (Persons/Sq. Mile)		
		City	U.A.	SMSA	City	U.A.	SMSA	City	U.A.	SMSA
17	San Jose	629	1,244	1,295	158.0	326	1,293	3,984	3,816	1,002
23	Seattle	494	1,392	1,607	144.6	485	4,226	3,415	2,869	380
53	Tampa/	272	521	1,569	84.4	231	2,071	3,217	2,255	758
58	St. Petersburg	239	833	---	55.5	296	---	4,300	2,815	---
15	Washington, DC	638	2,763	3,061	62.7	807	2,810	10,181	3,424	1,089

Key to Notes

a -- In some instances, the name of the "Locality" listed is an abbreviation of the exact title for certain urbanized areas and SMSAs. See sources below.

SOURCE: U.S. Bureau of the Census, Statistical Abstract of the United States: 1984 (104th edition), Washington, D.C., 1983; U.S. Bureau of the Census, State and Metropolitan Area Data Book, 1982 U.S. Government Printing Office, 1982; U.S. Bureau of the Census, 1980 Census of Population, Vol. 1, Characteristics of the Population, Ch. A, Number of Inhabitants: United States Summary, April 1983.

Table A-2

VEHICLE OWNERSHIP DISTRIBUTION FOR THE URBANIZED AREA OF
LOCALITIES GENERALLY INCLUDED IN SUBSEQUENT TABLES
(Includes Autos, Trucks, and Vans)^a

Study Area	Year	% Vehicles Available (for Households)			
		0	1	2	3 or More
Atlanta	1980	12.1	34.3	35.7	17.9
Baltimore	1980	20.9	37.5	30.8	10.8
Boston	1980	20.8	42.3	27.7	9.2
Buffalo	1980	19.0	43.5	28.6	8.9
Chicago	1980	21.1	40.0	29.4	9.5
Cincinnati	1980	16.1	36.7	33.6	13.6
Dallas	1980	6.8	34.8	37.2	21.2
Denver	1980	8.6	34.1	35.1	22.2
Detroit	1980	13.1	36.0	35.2	15.7
Honolulu	1980	12.6	43.4	29.4	14.6
Indianapolis	1980	11.1	38.2	36.2	14.5
Kansas City	1980	11.0	36.1	36.3	16.6
Los Angeles	1980	11.1	37.4	32.3	19.2
Louisville	1980	13.6	36.4	35.6	14.4
Miami	1980	18.4	40.8	29.5	11.3
Milwaukee	1980	16.1	39.7	32.7	11.5
Minn./St. Paul	1980	11.7	36.8	35.5	16.0
New York	1980	36.1	34.4	21.9	7.6
Oklahoma City	1980	6.7	35.6	37.2	20.5
Philadelphia	1980	22.2	39.0	28.9	9.9
Phoenix	1980	6.1	38.3	34.2	21.4
Portland	1980	11.9	36.9	33.0	18.2
Sacramento	1980	9.4	36.6	33.6	20.4
St. Petersburg	1980	12.0	52.6	26.2	9.2
San Antonio	1980	10.9	36.9	34.0	18.2
San Diego	1980	9.8	37.3	32.6	20.3
San Francisco	1980	15.8	38.0	30.3	15.9
Seattle	1980	11.0	34.4	33.6	21.0
Tucson	1980	8.0	39.8	32.7	19.5
Washington, DC	1980	14.7	39.3	32.6	13.4

Key to Notes

a -- For data on vehicle registrations consult: Rand McNally & Co. Commercial Atlas and Marketing Guide, 1984 edition.

SOURCE: U.S. Bureau of the Census, 1980 Census of Housing, Vol. 1, Characteristics of Housing Units, Ch. 8, Detailed Housing Characteristics, June 1983.

Table A-3

DEMOGRAPHIC CHARACTERISTICS FOR STUDY AREAS
INCLUDED IN SUBSEQUENT TABLES

Study Area	Year	Study Area Description	Population	Employment	Number of Households	Persons per Household	Employees per Person	Average Per Capita Income (\$)
Baltimore	1975	T.P.A. ^a	1,749,125	776,522	---	---	0.44	---
Dallas	1980	T.P.A.	2,679,065	1,403,915	988,486	2.71	0.52	8,516
Denver	1980	T.P.A.	1,556,400	853,900	586,800	2.60	0.55	11,300
Denver	1980	Urbanized Area	1,352,000	---	514,629	2.58	---	11,631 ^b
Denver	1980	City	492,365	363,000	211,566	2.27	---	8,555 ^b
Los Angeles	1976	6 County	11,180,400	4,626,700	3,937,200	2.84	0.41	12,900 ^d
Louisville	1980	Urban Area	835,001	393,532	303,049	2.76	0.47	9,520
Louisville	1980	MSA	929,480	409,977	331,878	2.80	0.44	---
Miami	1980	SMSA	1,626,000	716,000	---	---	---	---
Milwaukee	1972	7 County	1,810,700	748,800	557,300	3.22	0.41	3,836
Minn./St. Paul	1982	7 County	2,002,000 ^d	1,075,000	721,000	2.69	0.54	---
New York	1982	27 County	17,965,100	8,559,500	---	---	0.48	---
Philadelphia	1977	SMSA(+) ^c	5,123,946	2,141,334	1,641,276	2.47	0.42	---
Phoenix	1980	T.P.A.	1,525,897	638,028	564,687	2.70	0.42	---
Portland	1977	SMSA	967,384	---	409,965	2.36	---	---
St. Petersburg	1980	County	728,531	---	323,792	2.25	---	7,666 ^b
San Antonio	1980	County	988,800	---	---	---	---	---
San Diego	1977	County (-) ^c	1,695,000	---	605,000	2.80	---	7,500
San Francisco	80/81	CMSA (-)	5,051,000	2,733,000	1,970,000	2.56	0.54	10,358
Seattle	1977	T.P.A.	---	659,158	654,593	---	---	---
Springfield, MA	1980	2 County	581,831	257,519	213,908	2.72	0.44	---
Tucson	1980	County	531,900	192,600	---	---	0.44	---

Key to Notes

a -- Transportation Planning Area

b -- For 1979

c -- Includes an area slightly larger (+) or smaller (-) than the Study Area Description listed

d -- Median.

SOURCE: Reports from individual study areas.

B. TRIP GENERATION: PERSON AND VEHICLE TRIPS

This section presents data on total person and vehicle trip rates for selected study areas in the United States. Trip rates are further cross-classified by pertinent factors such as automobiles per household, income, size of household, and trip purpose. Depending on local practice, certain trip-purpose factors are presented according to the "home-based" and "nonhome-based" convention (which classifies trips according to the origin and destination purpose), while other tables use only destination purpose to assign trip purpose. In some instances, transit trip rates are also presented.

Given information on population and average trip rates for either an entire area or disaggregated by a particular market segment, it is possible to compute an approximate estimate of the total number of trips made in an area. Caution must be exercised on the basic definition of trips; for example, do they include walking or only motorized modes, trips by trucks, trips by persons of all ages, and for transit are they linked or unlinked trips.

Table B-1

TOTAL DAILY PERSON TRIPS BY AREA RESIDENTS

<u>Study Area</u>	<u>Year</u>	<u>Study Area Description^a</u>	<u>Total Person Trips</u>	<u>Notes</u>
Atlanta	1972	1,640,000	4,087,000	--
Baltimore	1977	T.P.A.	3,407,541	--
Dallas	1980	T.P.A.	11,103,909	--
Denver	1982	Urbanized Area	4,852,000	b
Indianapolis	1973	T.P.A.	2,060,000	--
Los Angeles	1976	6 County	31,949,900	--
Louisville	1975	T.P.A.	1,857,765	c
Miami	1980	SMSA	5,219,000	d
Milwaukee	1972	7 County	4,681,800	e
Minn./St. Paul	1982	7 County	6,700,000	--
Philadelphia	1977	SMSA (+)	25,380,000	--
Phoenix	1980	T.P.A.	3,715,565	--
Portland	1977	SMSA	3,550,300	--
San Francisco	80/81	CMSA (-)	17,168,000	--
Seattle	1977	T.P.A.	5,507,910	--
Washington, DC	1968	2,714,000	5,879,000	--
NPTS	1969	USA	145,146	f
NPTS	1977	USA	211,778	f
NPTS	1983	USA	224,385	f

Key to Notes

a -- Numbers in this column refer to study area population.

b -- For a typical weekday.

c -- Calculated assuming truck occupancy equals 1.0.

d -- Taxi not included.

e -- Walk not included.

f -- In millions.

SOURCE: Reports from individual study areas.

Table B-2

TRIP GENERATION: PER PERSON, PER HOUSEHOLD

Study Area	Year	Study Area Description	Person per Person	Trips per Household	Persons per Household	Persons per Vehicle	Vehicles per Household	Vehicle Trips per Household
Atlanta	1972	1,640,000	2.49	7.20	2.9	2.1	1.38	---
Baltimore	1977	T.P.A.	2.9	8.3	2.8	---	---	---
Buffalo	1973	1,234,000	2.5	7.5	3.0	2.5	1.2	---
Chicago	1979	City	1.6	4.6	2.9	---	---	---
Chicago	1979	SMSA	2.4	7.2	3.0	---	---	---
Dallas	1984	T.P.A.	3.40	8.68	2.6	1.4	1.84	6.4
Detroit ^a	1980	7 County	2.59	7.47	2.9	---	---	---
Denver	1980	T.P.A.	---	---	---	---	2.27	8.3 (U.A.)
Denver	1971	T.P.A.	2.83	8.76	3.10	2.21	1.40	---
Duluth	1970	157,000	2.83	8.23	2.91	2.88	1.01 ^b	---
El Paso	1970	362,800	2.53	8.68	3.43	3.03	1.13 ^b	---
Fresno/Clovis	1972	295,000	3.00	8.25	2.74	2.27	1.21 ^b	---
Greensboro	1970	182,000	2.44	8.29	3.40	2.43	1.40 ^b	---
Huntington	1972	215,000	2.86	9.09	3.18	2.89	1.10 ^b	---
Los Angeles	1976	6 County	2.99	8.15	2.8	1.8	1.6	---
Louisville	1975	Urban Area	2.19	6.34	2.90	1.91	1.52	5.0
Miami	1980	SMSA	3.2	---	---	---	---	---
Milwaukee	1972	7 County	2.5	7.9	3.2	2.6	1.24 ^b	6.1
Minn./St. Paul	1982	7 County	3.37	---	---	---	1.58	6.9
Philadelphia	1977	SMSA (+)	2.45	7.66	2.5	2.45	1.27	6.0
Phoenix	1980	T.P.A.	2.44	6.58	2.7	---	---	---
Portland	1977	SMSA	3.67	8.66	2.4	---	---	---
Rochester	1974	735,000	2.56	8.03	3.14	2.75	---	---
Sacramento	1978	3 County	3.39	9.34	2.6	1.6	---	---
San Antonio	1980	County	---	---	---	1.39	---	---
San Diego	1977	County	3.5	9.8	2.8	1.71	1.64	---
San Francisco	80/81	CMSA (-)	3.40 ^c	8.71	2.56	1.52	1.70	---
Seattle	1977	T.P.A.	---	6.63	---	---	---	---
Springfield, MA	1981	2 County	---	---	---	---	1.51	---
Washington, DC	1968	2,714,000	2.17	---	---	2.58	---	---
NPTS	1969	USA	2.02 ^{d,e}	6.36 ^{d,e}	3.2	---	1.2	3.8 ^d
NPTS	1977	USA	2.72 ^d	7.20 ^d	2.8	1.77	1.6	4.0 ^d
NPTS	1983	USA	2.68 ^d	7.69 ^d	2.7	1.60	1.7	4.1 ^d

Key to Notes

a -- Recession may have reduced trip rates.

b -- Autos per household.

c -- Trips per person 5 years and older equals 3.63.

d -- Based on 365 days per year.

e -- Does not include walk and bicycle trips and trips made by persons under 5 years old.

SOURCE: Reports from individual study areas.

Table B-3

PERSON TRIPS GENERATED PER HOUSEHOLD
BY AUTO OWNERSHIP

Study Area	Year	Area Description	Autos per Household				All Households
			0	1	2	3+	
Buffalo	1973	1,234,000	1.6	6.9	11.5	16.9	7.5
Cincinnati	1972	T.P.A.	2.0	6.5	-----	11.6-----	---
Chicago ^a	1979	City	1.9	5.3	7.7	9.5	4.6
Chicago ^a	1979	SMSA	1.7	6.4	10.7	12.7	7.2
Fresno	1971	295,000	1.3	6.7	-----	12.0-----	8.2
Los Angeles	1976	6 County	2.0	5.8	-----	11.0-----	8.1
Milwaukee	1972	7 County	1.9	7.0	11.5	16.0	7.9
Minneapolis/St. Paul	1982	7 County	1.8	6.5	11.1	16.4	9.1
Monterey	1970	T.P.A.	1.2	6.6	-----	12.0-----	---
Portland	1977	SMSA	3.0	6.8	-----	11.5-----	8.7
Rochester	1974	735,000	2.2	7.1	11.1	14.0	8.0
San Diego ^b	1977	County	3.0	6.6	-----	13.0-----	9.8
San Francisco	80/81	CMSA (-)	4.0	6.3	10.1	13.4	8.7
Washington, DC	1968	2,714,000	2.1	5.9	9.7	10.6	---

Key to Notes

a -- Shown are person trips per occupied dwelling unit.

b -- Person trips not including motorcycle, bicycle, walking.

SOURCE: Reports from individual study areas.

Table B-4

TRANSIT TRIPS GENERATED PER HOUSEHOLD
BY AUTO OWNERSHIP

Study Area	Year	Study Area Description	Autos Per Households				All Households
			0	1	2	3	4+
Milwaukee ^a	1972	T.P.A.	2.7	2.5	2.3	-----	2.5
San Francisco	80/81	CMSA(-)	1.56	0.50	0.41	0.38	0.56

Key to Notes

a -- Rates are only for households making one or more transit trips.

SOURCE: Reports from individual study areas.

Table B-5

PERSON TRIPS GENERATED PER HOUSEHOLD
BY HOUSEHOLD INCOME

Study Area	Year	Area Description	\$0- 4,999	\$5- 9,999	\$10- 14,999	\$15- 24,999	\$25- 34,999	\$35- 49,999	\$50,000+	All Income	Notes
Baltimore	1977	T.P.A.	---	5.0---	8.1 ^a	---	---	11.6 ^a	---	8.3	
Chicago	1979	SMSA	---	3.0---	5.8	7.0	---	11.9---	---	7.2	b
Los Angeles	1976	6 County	4.2	6.1	8.1	10.9	12.2	---	12.6---	8.1	c
Milwaukee	1972	7 County	3.4	7.2	10.7	12.2	---	13.9---	---	8.8	c
Minneapolis/St. Paul	1982	7 County	---	3.9---	6.3	8.6	11.2	---	12.9---	9.1	
Phoenix	1980	T.P.A.	3.4	4.6	5.6	7.1	---	8.6---	---	6.7	c
Portland	1977	SMSA	---	4.6---	---	8.9---	---	12.6---	---	8.7	d
San Diego	1977	County	3.2 ^h	7.0 ^h	8.9 ^h	12.3 ^h	14.6	14.1	15.8	9.5	e,f
San Francisco	80/81	CMSA (-)	3.6	5.7	7.2	8.5	10.9	11.7	12.5	8.7	g
NPTS	1983	USA	---	5.3---	10.2 ⁱ	14.7 ⁱ	14.5 ⁱ	---	19.7 ⁱ ---	11.7	

Key to Notes

a -- Income categories are \$10,000-18,999 and \$19,000 and over.

b -- Income categories are 0-\$9,000 and \$9,001-15,000.

c -- Recomputed from different income groupings.

d -- Income categories are 0-\$7,999, \$8-19,000, and \$20,000 and over.

e -- Income in 1977 dollars.

f -- Does not include trips by motorcycle, bicycle, walking.

g -- Average equals 9.06 for households reporting income.

h -- Calculated by simple averaging over smaller income categories.

i -- Income categories are \$10-19,999; \$20-29,999; \$30-39,999; and \$40,000 and over.

SOURCE: Reports from individual study areas.

Table B-6

AVERAGE DAILY VEHICLE TRIPS PER HOUSEHOLD BY FAMILY INCOME
AND VEHICLE OWNERSHIP (1983/4)

Family Income (Dollars)	Number of Household Vehicles				
	1	2	3	4+	All
0-9,999	2.6	3.7	5.1	6.8	1.9
10-19,999	3.1	4.9	5.5	7.0	3.8
20-29,999	3.4	5.1	5.9	8.5	4.9
30-39,999	3.1	5.4	7.0	8.2	5.6
40,000+	2.9	5.7	6.9	9.2	6.2
All	3.0	5.1	6.3	8.4	4.1

SOURCE: Federal Highway Administration, Survey Data Tabulations: 1983-1984 Nationwide Personal Transportation Study, November 1985, p. 11.

Table B-7

PERSON TRIPS PER HOUSEHOLD BY HOUSEHOLD SIZE

Study Area	Year	Study Area Description	Size of Household					All Households
			1	2	3	4	5+	
Baltimore	1977	T.P.A.	2.7	5.7	7.1	10.3	14.0	8.3
Buffalo	1973	T.P.A.	2.0	5.0	8.5	11.2	13.7	7.5
Chicago	1979	SMSA	2.3	5.4	6.3	9.3	14.1	7.2
Los Angeles	1976	6 County	3.02	6.46	8.70	-----	12.87	8.15
Milwaukee	1972	7 County	2.4	5.5	8.2	10.4	13.5	7.9
Minn./St. Paul	1982	7 County	3.05	7.01	10.13	13.70	18.04	9.08
Phoenix	1980	T.P.A.	2.89	5.63	7.38	8.73	11.04	6.72
Rochester	1974	T.P.A.	2.3	5.6	8.3	11.1	13.6	8.0
Sacramento	1978	3 County (-)	3.02	6.96	9.82	-----	17.88	9.34
San Diego	1977	County (-)	3.20	7.23	10.91	-----	16.44	9.97
San Francisco	80/81	CMSA (-)	3.95	7.08	9.65	13.53	17.72	8.71
NPTS	1977	USA	2.39	4.33	6.21	7.59	9.02	---

SOURCE: Reports from individual study areas.

Table B-8

PERSON TRIPS PER PERSON BY HOUSEHOLD SIZE

Study Area	Year	Study Area Description	Size of Household					All Households
			1	2	3	4	5+	
Buffalo	1973	T.P.A.	2.0	2.5	2.8	2.8	2.6	2.5
Chicago	1979	SMSA	2.3	2.7	2.1	2.3	2.5	2.4
Los Angeles	1976	6 County	3.02	3.23	3.01	-----	2.68	2.99
Milwaukee	1972	7 County	2.4	2.8	2.7	2.6	2.2	2.5
Phoenix	1980	T.P.A.	2.9	2.8	2.5	2.2	1.9	2.4
Rochester	1974	T.P.A.	2.3	2.8	2.8	2.8	2.6	2.6
Sacramento	1978	3 County (-)	3.02	3.48	3.27	-----	3.67	3.39
San Diego	1977	County (-)	3.20	3.62	3.64	-----	3.46	3.50
San Francisco	80/81	CMSA (-)	3.95	3.54	3.22	3.38	3.16	3.40
NPTS	1977	USA	2.39	2.16	2.07	1.89	1.76	---

SOURCE: Reports from individual study areas.

Table B-9

PERSON TRIPS BY HOME- AND NONHOME-BASED

Study Area	Year	Study Area Description	Percentage Distribution			Total
			Home- Based Work	Home- Based NonWork	Nonhome- Based	
Atlanta	1972	1,640,000	25.4	55.4	19.2	100
Baltimore	1977	1,749,125	22.3	54.7	23.0	100
Cincinnati	1978	T.P.A.	28.7	53.3	18.0	100
Dallas	1980	T.P.A.	19.9	59.7	20.4	100
Denver	1982	Urbanized Area	25.2	54.0	20.8	100
Detroit	1980	7 County	20.3	53.8	25.9	100
El Paso	1970	363,000	19.7	55.9	24.4	100
Evansville	1978	T.P.A.	19.1	46.9	34.0	100
Indianapolis	1970	T.P.A.	25.4	53.4	21.2	100
Kansas City	1970	8 County	18.7 ^a	59.1	22.2	100
Los Angeles	1976	6 County	19.2	52.7	28.2	100
Louisville	1975	Urbanized Area	26.6	54.1	19.3	100
Milwaukee	1972	7 County	33.0	47.0	20.0	100
Minn./St. Paul	1982	7 County	17.9	53.7	28.4 ^b	100
Pensacola	1970	T.P.A.	14.8	59.2	26.0	100
Philadelphia	1977	SMSA(+)	23.0	55.0	22.0	100
Phoenix	1980	T.P.A.	25.7	53.5	20.8	100
Portland	1977	SMSA	19.3	57.9	22.8	100
Sacramento	1978	3 County (-)	13.9	58.8	27.3	100
San Diego	1977	County (-)	14.6	57.5	28.0	100
San Francisco	1980	9 County	18.2	51.4	30.4	100
Washington, DC	1968	2,714,000	24.4	62.8	12.8	100

Key to Notes

a -- "Serve Passenger" not included in Home-Based Work trip purpose.

b -- 45 percent are Nonhome-Based Work trips.

SOURCE: Reports from individual study areas.

Table B-10

HOME-BASED PERSON TRIPS BY TRIP PURPOSE

Study Area	Year	Study Area Description	Home-Based Trips as % of All Trips	Percent of Home-Based Trips to & from:				Total Home-Based Trips per Household
				Work	School	Shop	Soc/Rec Other	
Atlanta	1972	1,640,000	80.8	31.4	---	---	---	5.8
Dallas	1984	T.P.A.	74.7	36.1	---	---	---	6.4
Denver	1982	Urbanized Area	79.2	31.8	---	21.5	---	---
Detroit	1980	7 County	74.1	27.4	---	---	---	5.5
Detroit	1965	4,042,000	77.6	20.8	17.0	19.8	22.2	6.6
Detroit	1953	2,969,000	87.0	41.6	6.3	13.9	20.1	4.7
El Paso	1970	363,000	75.6	26.0	14.0	19.0	17.0	6.6
Fresno	1971	245,000	69.3	24.8	---	18.3	---	5.9
Indianapolis	1970	T.P.A.	78.8	32.2	13.1	18.3	---	---
Louisville	1975	Urban Area	80.7	33.0	---	21.6	21.2	---
Philadelphia	1977	SMSA (+)	78.0	29.5	---	---	---	---
Philadelphia	1960	4,007,000	85.4	34.8	6.6	12.7	17.1	3.9
Phoenix	1980	T.P.A.	79.2	32.4	11.4	20.5	---	---
Portland	1977	SMSA	77.2	25.0	14.0	---	21.3	---
San Diego	1977	County	71.0	22.3	---	18.2	---	7.0
San Francisco	80/81	CMSA (-)	73.2	29.6	14.9	---	19.8	6.4
Washington, DC	1968	2,714,000	87.2	28.0	8.0	23.4	17.7	6.3

Key to Notes

a -- Includes shop, personal business, and serve passenger.

SOURCE: Reports from individual study areas.

Table B-11

TRANSIT PERSON TRIPS BY TRIP PURPOSE
(In Percent)

Study Area	Year	Study Area Description	Mode	Trip Definition	Home-Based Transit Trips				Nonhome-Based	Total
					Work	School	Shop	Soc/Rec		
Atlanta	1980	7 County	Rapid Rail	Linked	50.4	19.5	1.8	7.2 ^b	11.4	100
Atlanta	1980	7 County	Bus	Linked	50.0	16.3	4.8	9.8 ^b	11.3	100
Atlanta	1980	7 County	All	Linked	50.1	17.4	3.7	8.9 ^b	11.4	100
Baltimore	1977	T.P.A.	Bus	Linked	34.5	-----	-----	52.0	13.5	100
Boston	1978	79 Cities	Bus	Unlinked	48.5	18.3	8.1	4.4	10.4	100
Boston	1978	79 Cities	Rapid Rail	Unlinked	53.6	12.6	---	---	16.3	100
Cincinnati	1978	T.P.A.	Bus	Linked	40.1	17.6	---	---	17.5	100
Detroit	1980	7 County	Bus	Unlinked	36.7	-----	-----	50.0	13.3	100
Denver	1978	4 County	Bus	Unlinked	49.9	15.6	8.4	4.5	14.0	100
Indianapolis	1973	T.P.A.	Bus	Unlinked	58.2	13.6	11.9	---	16.3	100
Minn./St. Paul	1982	7 County	Bus	Linked	36.8	a	---	41.4	21.8	100
Philadelphia	1977	SMSA (+)	All	Linked	55.4	---	---	---	10.6	100
Portland	1977	SMSA	Bus	Linked	31.9	18.9	---	9.9	17.2	100
San Diego	1977	County	All	Unlinked	35.0	24.4	10.8	-----	10.4	100
San Francisco	80/81	CMSA (-)	Bus	Linked	36.9	22.6	15.2	8.0	17.3	100

Key to Notes

a -- School bus trips not included.

b -- Personal business.

c -- Included in "shop."

SOURCE: Reports from individual study areas.

Table B-12

TRIP PURPOSE OF TRANSIT TRIPS

Study Area	Year	Trip Definition	Trip Purpose (in Percent) ^a						
			Home	Work	School	Shop	Personal Business	Social/ Recreation	Other
Commuter Rail									
Boston	1977	Unlinked	---	78.5	11.6	-----	2.3	---	7.6
Philadelphia	1982	Unlinked	---	88	6	2	---	1	3
Rapid Rail									
San Francisco	1976	Unlinked	---	66.8	11.2	---	8.5	---	13.5
Washington, DC	1984	Unlinked	---	63.4	4.4	5.4	7.7	3.6	15.4
Bus									
Albuquerque	1981	Unlinked	---	41	34	14	---	6	5
Erie, PA	1982	Unlinked	31.0	25.0	12.8	13.2	9.7	4.1	4.2
Oklahoma City	1984	Unlinked	---	68	11	7	---	4	10
Portland	1977	Linked	40.6	22.0	10.2	18.2	---	8.9	---
San Antonio	1983	Linked	37	27	12	7	9	2	4
Xenia, Ohio	1975	Unlinked	---	34	14	29	15	4	4

Key to Notes

a -- Defined at the nonhome end of the trip except for Erie, Portland, and San Antonio which are purposes at the destination end.

SOURCE: Reports from individual study areas.

Table B-13

WEEKDAY PERSON TRIPS PER HOUSEHOLD BY PURPOSE
AND AUTOMOBILE OWNERSHIPSan Francisco (1981)

Trip Purpose	Autos/Household					
	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4+</u>	<u>All</u>
<u>Home-Based</u>						
Work	0.72	1.30	2.21	2.79	3.68	1.89
Shop	1.16	1.74	2.66	3.25	3.05	2.27
Social-Recreational	0.63	0.97	1.41	1.83	2.01	1.26
School	0.54	0.58	1.06	1.60	1.89	0.95
<u>Nonhome-Based</u>	<u>0.95</u>	<u>1.71</u>	<u>2.75</u>	<u>3.31</u>	<u>3.95</u>	<u>2.34</u>
TOTAL	4.00	6.30	10.10	12.78	14.58	8.71
Percentage of Households	11%	35%	36%	12%	6%	100%

SOURCE: H. Kollo and C.L. Purvis "Changes in Regional Travel Characteristics in the San Francisco Bay Area: 1960-1981", Transportation Research Record 987, 1984.

Table B-14

TRANSIT TRIP PURPOSE DISTRIBUTIONS FOR BUS AND RAIL SYSTEMS
(In Percent)

<u>System Type^a</u>	<u>Work</u>	<u>Medical</u>	<u>School</u>	<u>Shopping</u>	<u>Business</u>	<u>Social/ Recreation</u>	<u>Other</u>
<u>BUS</u>							
Large Bus Systems	54.1	4.1	16.1	9.6	7.1	6.1	2.9
Highly Peaked Systems	46.1	3.6	23.5	9.4	7.7	4.8	4.9
High Speed Systems	37.5	8.6	21.5	18.4	6.9	4.2	2.9
Large Mainstream Systems	61.3	2.5	13.3	7.1	10.7	2.8	2.4
Large Sunbelt Systems	43.6	2.4	20.4	10.2	13.9	7.0	2.4
Large High Density Systems	53.0	6.0	18.0	11.0	6.0	6.0	10.0
Small Peaked Systems	49.8	4.2	14.9	11.3	10.1	4.6	5.1
Small Unpeaked, Slow	43.8	3.2	27.1	12.8	7.0	3.6	2.5
Small Unpeaked, Moderate Speed Systems	38.7	7.2	7.7	24.5	10.8	7.5	3.7
<u>RAIL (CR, RR, & LRT)</u>	<u>74.1</u>	<u>2.0</u>	<u>8.3</u>	<u>2.8</u>	<u>7.3</u>	<u>2.7</u>	<u>2.8</u>
WEIGHTED AVERAGE	59.2	3.3	14.2	7.8	8.3	4.4	3.4

Key to Notes

a -- UMTA staff analysis of selected transit operator on-board surveys of transit riders, conducted primarily in 1981 and 1982. These operators account for about 20 percent of national ridership.

SOURCE: Urban Mass Transportation Administration, The Status of the Nation's Local Public Transportation: Conditions and Performance, Report to Congress under Section 310, September 1984, p. 27.

Table B-15

PERSON AND TRANSIT TRIP GENERATION RATES
NEAR WMATA RAIL STATIONS BY LAND USE TYPE

Washington, DC (1986)

<u>Land Use</u>	<u>Typical Daily Person-Trip Generation Rate (per 1,000 S.F. GFA)</u>	<u>Typical Daily Transit Mode Share^a</u>	<u>Implied Daily Transit Trip Generation Rate (per 1,000 S.F. GFA)</u>
<u>Office</u>			
Downtown	15	35%	5.3
Close-in suburban stations	15	15	2.3
<u>Residential^b</u>			
Close-in suburban stations	5	35	1.8
<u>Retail (major complex)</u>			
Downtown	30	35	10.5
Close-in suburban stations	30	15	4.5
<u>Hotel^c</u>			
Downtown	14	15	2.1
Close-in suburban stations	14	10	1.4

Key to Notes

a -- Transit as a percentage of all trips, including walk trips. Transit mode shares as a percentage of nonwalk trips would be substantially higher, especially for office and retail uses.

b -- Assumes 750 square feet of gross floor area (GFA) per dwelling unit.

c -- Assumes 750 square feet of gross floor area per hotel guest room.

NOTE: Person-trip generation rates are "typical" rates derived from a combination of sources including data collected in the DC metropolitan area and from the Institute of Transportation Engineers' Trip Generation Manual. Rates for any individual site could vary widely from these typical rates.

SOURCE: JHK & Associates, Development-Related Ridership Survey: Final Report, prepared for the Washington Metropolitan Area Transit Authority, March 1987, p. 80.

Table B-16

VEHICLE TRIP ATTRACTION RATES BY LAND USE CATEGORIES

San Diego (1983)

<u>Land Use</u>	<u>Daily Trips (in and out) per:</u>		
	<u>1,000 S.F. GFA</u>	<u>Other</u>	<u>Acre of Land</u>
<u>Commercial</u>			
Regional Shopping Centers (sq. ft.)			
<100,000	120	---	1,200
100-300,000	70	---	700
>300,000	50	---	500
Offices			
Standard (<100,000 sq. ft.)	20	---	300
Large (>100,000 sq. ft.)	17	---	600
Government	30	---	---
Medical	90	---	800
<u>Industrial</u>			
General Manufacturing	4	---	40
Business Park (With Commercial)	16	---	200
Business Park (Without Commercial)	10	---	120
<u>Recreational</u>			
Parks -- City, Developed	---	---	50 ^a
Parks -- Amusement, Theme	---	---	80 ^b
Sports -- Outdoor Stadium	---	0.2/Seat	50
Sports -- Indoor Arena	---	0.1/Seat	30
Sports -- Racetrack	---	0.6/Seat	40
<u>Educational</u>			
Universities (4 Year)	---	2.5/Student	100
High Schools	---	1.5/Student	50
Elementary/Junior High Schools	---	1.0/Student	30
<u>Hospitals</u> (General)	20	20/Bed	200
<u>Residential</u>			
Single Family (4 DU/Acre)	---	10/DU	---
Condominium (<30 DU/Acre)	---	8/DU	---
Apartments (>30 DU/Acre)	---	6/DU	---

Key to Notes

a -- Double for weekends.

b -- Increase to 130/acre during summer.

SOURCE: San Diego Association of Governments, "Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region," August 1983.

C. TRIP LENGTH AND VMT DATA

This section can be thought of as the product of the trip distribution phase of travel demand modeling. Data are presented on average trip length characteristics for all trips and disaggregated by trip purpose and by mode. Where possible, trip lengths are reported in miles and/or minutes. Trip rates in combination with trip lengths can yield daily vehicle miles traveled. As in Section B, users should be aware that differences in the definitions of trips and whether trip times include just line-haul and/or access and transfer times can affect the transferability of the data.

Table C-1

AVERAGE PERSON TRIP LENGTH BY TRIP PURPOSE

Study Area	Year	Study Area Description	Home-Based Work		Home-Based Nonwork		Nonhome-Based		All Trips	
			Miles	Minutes	Miles	Minutes	Miles	Minutes	Miles	Minutes
Baltimore	1977	T.P.A.	6.6	---	4.0	---	4.9	---	4.9	---
Chicago ^{a,b}	1979	SMSA	7.3	---	4.5	---	3.3	---	4.6	---
Dallas	1984	T.P.A.	10.1	---	5.3	---	6.5	---	6.9	---
Indianapolis	1970	T.P.A.	---	19.0	---	12.9	---	14.2	---	14.5
Minn./St. Paul	1982	7 County	8.1	---	5.0	---	5.4	---	5.7	17
Philadelphia	1977	SMSA (+)	---	22.1	---	16.6	---	15.0	---	17.5
Phoenix	1980	T.P.A.	---	18.9	---	12.8	---	13.0	---	14.4
Portland	1977	SMSA	6.6	---	4.1	---	4.1	---	5.0	---
San Diego	1977	County	8.9	14.3	4.9	8.4	4.9	8.3	5.5	9.3
San Francisco	80/81	CMSA (-)	---	26.6	---	17.6	---	16.7	---	19.3
Seattle	1977	T.P.A.	---	22.1	---	---	---	15.4	---	---
Tucson	1977	T.P.A.	---	17.7	---	12.3	---	10.9	---	13.0
NPTS	1969	USA	---	---	---	---	---	---	9.7 ^c	---
NPTS	1977	USA	---	---	---	---	---	---	8.9	---
NPTS	1983	USA	---	---	---	---	---	---	8.7	---

Key to Notes

a -- Trip purposes classified as work, home, and other, reading across.

b -- Measured in airline miles.

c -- Does not include walk and bicycle trips and trips made by persons under 5 years old.

SOURCE: Reports from individual study areas.

Table C-2

AVERAGE TRIP LENGTH BY MODE
(In Miles)

Study Area	Year	Study Area Description	Auto	All Transit	Commuter Rail	Rapid Transit	Bus	Taxi	Other
Baltimore	1977	T.P.A.	5.0	4.1	---	---	4.1	---	---
Chicago	1956	5,169,700	4.4 ^c	---	14.6 ^c	7.2 ^c	3.6 ^c	---	---
Chicago	1970	7,593,000	5.0	---	18.5	7.9	3.9	---	3.0
Chicago ^c	1979	SMSA	4.5 ^a	6.4	---	---	---	2.1 ^b	---
Denver	1982	Urbanized Area	5.3	4.7 ^d	---	---	4.7 ^d	---	---
Minn./St. Paul	1982	7 County	5.9 ^e	5.0	---	---	5.0 ^e	---	8.3
New York	1983	City	---	---	22.1 ^f	7.0	2.4	---	---
New York	1963	16,302,000	3.8 ^c	---	17.6 ^c	5.8 ^c	2.5 ^c	2.1 ^c	---
Philadelphia	1977	SMSA (+)	6.2	4.9	18.4	4.8/7.58	2.6 ^h	---	---
Philadelphia	1960	4,007,000	3.4 ^c	---	10.2 ^c	5.9 ^c	3.0 ^c	---	---
Portland	1977	SMSA	4.9	6.0	---	---	6.0	---	2.0 ⁱ
San Diego	1977	County (-)	5.5	---	---	---	3.2	---	---
Washington, DC	1980	SMSA (-)	7.5	---	---	---	---	---	---
Washington, DC	1968	2,714,000	4.9 ^c	---	---	---	3.6 ^c	---	---
NPTS	1983	USA	7.6	---	19.4	10.6	6.1	3.0	---

Key to Notes

a -- Weighted average of auto driver (4.8) and auto passenger (3.4).

b -- Includes school bus.

c -- Measured in airline miles.

d -- For 1980.

e -- Auto passenger is 5.4 miles; school bus is 3.9 miles.

f -- Represents commuter rail in N.Y. and N.J.

g -- For Subway Elevated/PATCO High Speed.

h -- Includes surface trolley.

i -- Includes taxi, school bus, bicycle, and other.

SOURCE: Reports from individual study areas.

Table C-3

AVERAGE TRIP TIME BY MODE
(In Minutes)

<u>Study Area</u>	<u>Year</u>	<u>Area Description</u>	<u>Auto</u>	<u>All Transit</u>	<u>Commuter Rail</u>	<u>Rapid Transit</u>	<u>Bus</u>	<u>Taxi</u>	<u>Walk</u>	<u>Other</u>	<u>All</u>
Chicago	1970	7,593,000	25.1	45.8	---	---	---	---	---	---	---
Indianapolis	1973	T.P.A.	---	49.4	---	---	49.4	---	---	---	---
Philadelphia ^d	1977	SMSA (+)	---	13.9	30.5	12.7/13.2 ^a	11.7 ^b	12.75	---	---	---
San Francisco	80/81	CMSA (-)	18.0	46.6	---	---	28.8 ^c	---	12.5	15.8	19.3
NPTS	1983	USA	16.4	---	47.9	43.7	33.1	15.2	---	---	16.7

Key to Notes

- a -- For Subway Elevated/PATCO High Speed
b -- Includes surface trolley.
c -- School bus only.
d -- Values shown are in-vehicle trip times.

SOURCE: Reports from individual study areas.

Table C-4

DAILY VMT: TOTAL AND PER PERSON

Study Area	Year	Study Area Description	Total Daily VMT (000,000)	VMT per Person
Atlanta	1972	1,640,000	12.6	13.8
Chicago	1970	8 County	95.6	12.6
Chicago	1975	SMSA	99.0	---
Dallas	1983	County	40.6	24.7
Denver	1983	Urbanized Area	25.6	16.4
Detroit	1980	7 County	56.3	---
Evansville	1970	175,000	1.8	10.3
Honolulu	1970	750,000	8.9	11.9
Houston	1977	2,300,000	41.0	17.8
Los Angeles/Long Beach	1982	Urbanized Area	165.4	17.4
Louisville	1975	Urban Area	10.8	12.7
Louisville	1981	Urban Area	13.0	15.6
Milwaukee	1972	Urbanized Area	13.0	---
Milwaukee	1972	7 County	20.1	11.1
Minn./St. Paul	1980	7 County	36.1	18.2
New York City	1980	City	41.8	5.9
Philadelphia	1977	SMSA (+)	57.7 ^a	11.3
Phoenix	1979	T.P.A.	10.3 ^b	9.0
Portland	1977	SMSA	10.7	11.1
Sacramento	1982	Urbanized Area	15.2	19.1
San Diego	1982	Urbanized Area	30.8	18.1
San Francisco/Oakland	1982	Urbanized Area	52.6	16.5
San Jose	1982	Urbanized Area	22.0	17.7
Seattle	1975	1,800,000	23.6	13.1
St. Louis	1972	2,400,000	20.2	8.4
Tucson	1973	407,000	5.0	12.5
Washington, DC	1980	SMSA (-)	45.4 ^c	---
NPTS	1969	USA	---	10.6
NPTS	1983	USA	---	11.9

Key to Notes

a -- Includes 10.2 million VMT by truck.

b -- Major streets and freeways only.

c -- Includes 5.6 million VMT by truck.

SOURCE: Reports from individual study areas.

Table C-5

AVERAGE AUTO TRIP TIMES BY TRIP PURPOSE
(In Minutes)

Study Area	Year	Study Area Description	Home-Based				Nonhome- Based	All Trips	External- Internal
			Work	School	Shop	Soc./Rec			
Baltimore	1977	T.P.A.	15.6	---	---	---	12.6	---	---
Denver	1971	U.A.	18.6	---	10.6	---	---	15.1	33.0
Los Angeles	1976	6 County	30.1	---	16.4	---	21.7	23.5	---
Los Angeles	1967	9,008,400	17.8	---	5.4	---	8.2	11.0	---
Minn./St. Paul	1970	1,874,400	19.2	27.0	11.4	17.3	---	16.9	---
Philadelphia	1977	SMSA(+)	---	---	---	---	---	17.8	44.1
Sacramento	1978	3 County(-)	17.1	---	11.1	---	12.9	13.2	---
San Diego	1977	County(-)	24.6	---	14.8	---	18.5	19.6	---
San Francisco	80/81	CMSA(-)	24.5	17.2	---	18.6	16.3	18.0	---
San Francisco	1965	4,400,000	15.8	---	9.5	11.5	9.1	---	---
Wilmington	1970	T.P.A.	9.5	---	---	---	7.3	8.9	11.9

SOURCE: Reports from individual study areas.

D. MODE CHOICE AND AUTO OCCUPANCIES

This section presents information on total person and vehicle trips by mode (and vehicle type for vehicle trips) and by trip purpose. Because mode shares are sensitive to the size of the geographic area under consideration, one table contains modal shares for journey-to-work trips based on the consistent urbanized area definition used in the 1980 Census of Population. Users should note, however, that the Census records information on only the (single) mode used for the longest portion (based on distance) of the trip to work even though multiple modes might have been used. Thus, a relatively long trip by a single driver in an automobile followed by a short bus ride would be characterized as a "Drive Alone" trip.

Also presented in this section are average automobile occupancies by time of day and separately by trip purpose. Again, trip purpose is defined using the "home-based" and "nonhome-based" trip end convention as well as by purpose at the destination end. Internal trips are those with both ends in the study area; external trips have one end outside the study area; and through trips have neither end in the study area, but do pass through the study area.

Table D-1

AVERAGE DAILY PERSON TRIPS BY MODE

Study Area	Year	Study Area Description	Total Trips (000's)	Percent of Person Trips by Mode						Notes
				Auto Driver	Auto Passenger	Transit	Truck	Walk	Other	
Atlanta	1972	1,640,000	4,087	61.2	28.48	10.4	g	---	---	a
Baltimore	1977	T.P.A.	3,408	---	---	10.7	---	---	---	
Chicago	1979	City	---	50.6	18.4	29.7	---	---	1.3 ^d	
Chicago	1979	SMSA	---	65.0	21.5	10.4	---	---	3.1 ^d	
Denver	1982	Urbanized Area	6,025	58.0	20.0	2.5	19.5	---	---	b
El Paso	1970	362,800	919	---	---	6.6	---	---	---	j
Fresno/Clovis	1971	T.P.A.	889	---	---	3.6	---	---	---	j
Indianapolis	1973	T.P.A.	2,060	65.3	i	1.9	i	---	32.8 ⁱ	
Kansas City	1970	T.P.A.	3,573	---	---	7.5	---	---	---	j
Los Angeles	1976	6 County	---	59.7	22.0	3.1	---	11.9	2.6	g
Louisville	1978	835,000	1,858	---	---	7.7	---	---	---	i
Milwaukee	1972	7 County	4,505	64.3	27.2	8.0 ^e	---	---	0.5 ^f	
Minn./St. Paul	1982	7 County	---	68.8	20.4	3.8	---	---	7.0	b
Oklahoma City	1983	City	---	84 ^h	10	3	h	---	3	
Philadelphia	1977	5,123,900	12,690	---	---	8.0	---	---	---	j
Portland	1977	SMSA	3,550	60.7	22.8	7.1	---	7.9	1.5	b
Sacramento	1978	3 County (-)	---	57.7	23.7	4.3	0.5	9.3	4.5	b
San Diego	1977	County (-)	---	59.1	22.6	4.1	0.6	10.1	3.5	b
San Francisco	80/81	CMSA (-)	17,168	60.0	18.2	6.4	---	11.4	4.0 ^c	
Washington, DC	1968	2,714,000	5,879	60.0	---	11.2	---	---	30.9	
NPTS	1969	USA	145,146,000	---	---	8.3	5.6	---	1.0	b
NPTS	1983	USA	205,811,000	---	---	5.6	11.6	---	1.3	b

Key to Notes

- a -- Does not include trips by motorcycle, bicycle, walking.
b -- Transit includes school bus trips.
c -- Includes 174,000 school bus trips.
d -- Includes taxi and school bus.
e -- Includes 173,800 school bus trips.
f -- Does not include bicycle and walk.
g -- Truck included with auto; motorcycle not included.
h -- Truck included with auto driver.
i -- Includes special school bus and passengers for auto, truck, and taxi.
j -- Includes auto and transit trips only.

SOURCE: Reports from individual study areas.

Table D-2

DAILY PERSON TRIPS BY MODE AND TRIP PURPOSE
(In Percent)

Study Area	Year	Description	Auto Driver			Auto Passenger			Transit			Other		
			HBW	HBO	NHB	HBW	HBO	NHB	HBW	HBO	NHB	HBW	HBO	NHB
Minn./St. Paul	1982	7 County	80	62	75	12	25	18	8	13 ^a	6 ^a	0	0	1
Portland	1977	SMSA	80	52	66	11	26	25	6	9 ^a	3	3	13	6

Key to Notes

a -- Includes school bus trips.

SOURCE: Metropolitan Council of the Twin Cities Area, "1982 Travel Behavior Inventory," December 1984; Columbia Region Association of Governments, CRAG Travel Behavior Survey: Design, Implementation, and General Results, Technical Memorandum No. 10, July 12, 1978 (Revised).

Table D-3

JOURNEY TO WORK TRIPS FOR THE URBANIZED AREA OF LOCALITIES GENERALLY INCLUDED
IN OTHER TABLES^a
(In Percent)

Study Area	Year	Drive Alone ^b	Carpool ^b	Bus/ Streetcar	Subway	Railroad	Walk	Other
Atlanta	1980	69.5	18.2	8.2	0.8	0.0	2.0	1.2
Baltimore	1980	59.2	22.3	12.1	0.0	0.2	4.9	1.3
Boston	1980	56.2	17.3	8.7	6.1	0.9	9.2	1.6
Buffalo	1980	66.1	18.8	7.7	---	---	6.3	1.1
Chicago	1980	57.7	16.6	10.2	4.0	4.5	6.0	1.0
Cincinnati	1980	68.8	18.5	7.7	---	---	4.1	0.9
Dallas	1980	72.4	20.2	4.0	---	0.0	2.1	1.3
Denver	1980	67.4	20.4	6.4	---	---	4.3	1.5
Detroit	1980	75.8	16.6	4.0	---	0.1	2.8	0.7
Indianapolis	1980	70.7	20.7	4.8	---	---	2.9	0.9
Kansas City	1980	70.7	20.9	4.7	---	---	2.7	1.0
Los Angeles	1980	71.2	16.9	5.8	---	---	3.5	2.6
Miami	1980	68.1	19.8	6.6	0.0	0.0	3.5	2.0
Milwaukee	1980	65.3	18.9	8.8	---	0.0	6.0	1.0
Minn./St. Paul	1980	64.7	19.2	10.0	---	---	4.9	1.2
New York	1980	45.1	14.5	9.1	17.6	4.0	8.0	1.7
Oklahoma City	1980	74.5	19.9	1.3	---	---	2.8	1.5
Philadelphia	1980	58.3	17.8	8.7	3.9	3.4	6.8	1.1
Phoenix	1980	71.8	19.1	2.0	---	---	3.0	4.1
Pittsburgh	1980	59.2	19.3	13.7	---	0.1	7.1	0.6
Portland	1980	65.8	18.0	9.8	---	---	4.4	2.0
Sacramento	1980	71.1	18.3	4.1	0.0	0.0	3.0	3.5
San Diego	1980	65.6	17.8	3.4	---	0.0	9.3	3.9
San Francisco	1980	58.8	16.0	13.7	2.5	0.7	5.3	3.0
Seattle	1980	64.4	18.2	10.7	---	---	4.5	2.2
Washington,DC	1980	53.7	22.8	11.7	4.8	0.2	5.2	1.6

Key to Notes

a -- Principal mode for workers 16 years and over who work outside home.

b -- Drive alone and carpool includes car, truck, and vans.

SOURCE: U.S. Bureau of Census, 1980 Census of Population, Vol. 1, Characteristics of the Population, Ch.C., General Social and Economic Characteristics, June 1983.

Table D-4

AVERAGE DAILY VEHICLE TRIPS BY VEHICLE TYPE

Study Area	Year	Study Area Description	Total Vehicle Trips ^a	Internal Vehicles						External Vehicles
				Autos	Motorcycle	Taxi	Light	Medium	Heavy	
Denver	1982	Urbanized Area	4,291,000	3,774,000	---	---	---	517,000	---	---
Indianapolis	1970	T.P.A.	1,648,234	1,344,542	---	---	200,365	---	90,467	12,860 ^b
Louisville	1975	Urban Area	1,520,289	1,299,514	---	26,726	---	---	---	9,940 ^b
Milwaukee	1972	7 County	3,416,000	2,897,000	8,000	14,300	185,800	173,500	11,700	125,700 ^c
Minn./St. Paul	1982	7 County	4,985,000	---	---	---	---	---	---	---
Philadelphia	1977	SMSA (+)	9,910,000	7,631,000	---	---	---	1,580,000	---	---
Washington	1980	SMSA (-)	5,890,000	5,320,000	---	---	---	570,000	---	---

Key to Notes

a -- A summation of the trips shown which may or may not include external trips.

b -- Through trips.

c -- External truck vehicle trips equals 24,900.

SOURCE: Reports from individual study areas.

Table D-5

VEHICLE TRIPS BY TRUCK AND EXTERNAL TRIPS
(In Percent)

Study Area	Year	Study Area Description	Percent of Vehicle Trips that are:		
			Internal Trucks	Entering/Leaving Study Area	Passing Through Study Area
Baltimore	1977	T.P.A.	---	4.1	---
Chicago	1970	7,593,000	10.1	---	---
Denver	1982	Urbanized Area	12	5.8	0.5
El Paso	1970	362,800	13.5	---	---
Honolulu	1981	County	12.0	---	---
Indianapolis	1970	T.P.A.	---	---	0.1
Louisville	1975	Urban Area	12.1	6.4	0.7
Louisville	1982	Urban Area	9.3	---	---
Milwaukee	1972	7 County	12.7	3.7	---
Minn./St. Paul	1970	1,874,000	14.0	---	---
Philadelphia	1977	SMSA (+)	15.9	4.2	0.1
Washington	1980	SMSA (-)	9.7	---	---

SOURCE: Reports from individual study areas.

Table D-6

DAILY VEHICLE TRIPS PER VEHICLE BY TYPE OF VEHICLE

Study Area	Year	Study Area Description	Average Daily Vehicle Trips Per						
			Auto	Motorcycle	Taxi	Light Trucks	Medium Trucks	Heavy Trucks	Total
Chicago	1970	7,593,000	---	---	---	5.3	9.9	6.4	5.6
Los Angeles	1976	6 County	---	---	---	---	---	---	3.5
Milwaukee	1972	7 County	4.1	0.4	31.8	3.6	7.6	3.4	4.1
San Diego	1977	County (-)	4.0	---	---	---	---	---	---

SOURCE: Reports from individual study areas.

Table D-7

AUTO OCCUPANCY BY TIME OF DAY

Study Area	Year	Study Area Description	Average Auto Occupancy		
			All Trips	Peak Periods	Off-Peak
Atlanta	1981	7 County	1.41 ^a	---	---
Chicago	1979	SMSA	1.33	---	---
Chicago	1970	7,593,000	1.5	---	---
Chicago	1956	5,169,700	1.6	---	---
Dallas	1980	T.P.A.	1.44	---	---
Denver	1982	Urbanized Area	1.23	1.20	1.32
Detroit	1980	7 County	1.41	---	---
El Paso	1970	362,800	1.41	---	---
Honolulu	1981	County	1.52	---	---
Kansas City	1970	1,237,000	1.41	---	---
Los Angeles	1976	6 County	1.4	---	---
Louisville	1982	Urban Area	1.32	---	---
Milwaukee	1972	7 County	1.43	---	---
Minn./St. Paul	1982	7 County	1.30	1.26 ^b	---
Philadelphia	1977	SMSA (+)	1.53	---	---
Phoenix	1982	T.P.A.	1.30 ^c	1.26 ^d	1.31 ^e
Portland	1977	SMSA	1.50	---	---
San Antonio	1982	County	1.36	1.28 ^d	1.39
San Diego	1981	County	1.24	---	---
San Francisco	80/81	CMSA (-)	1.30	---	---

Key to Notes

a -- Includes light trucks.

b -- Morning peak equals 1.22; evening peak equals 1.31.

c -- Twelve-hour average (6:00 A.M. to 6:00 P.M.).

d -- Unweighted average of A.M. and P.M. peak.

e -- Unweighted average of midmorning and midafternoon.

SOURCE: Reports from individual study areas.

Table D-8

AUTO OCCUPANCY BY DESTINATION TRIP PURPOSE

<u>Study Area</u>	<u>Year</u>	<u>Study Area Description</u>	<u>Home</u>	<u>Work</u>	<u>Personal Business</u>	<u>Social Recreation</u>	<u>Shop</u>	<u>Other</u>	<u>All</u>
Albuquerque	1981	T.P.A.	---	1.22	---	1.88	1.57	---	1.51
Chicago	1979	SMSA	1.33	1.14	---	---	---	1.44	1.33
Detroit	1980	7 County	---	1.22	---	---	---	---	1.41
El Paso	1970	362,800	---	1.2	1.4	1.7	---	1.5	1.5
Milwaukee	1972	7 County	1.43	1.15	1.35	1.91	1.46	---	1.41
Portland	1977	SMSA	1.45	1.13	---	1.72	1.51	---	1.50
San Diego	1977	County (-)	1.44	1.14	1.22	1.78	1.56	1.42	1.49
San Francisco	80/81	CMSA (-)	---	1.1	---	1.7	1.2	---	1.3
Springfield, MA	1980	2 County	---	1.14	---	---	---	---	1.35
NPTS	1969	USA	---	1.4	1.9	2.5	2.0	---	1.9
NTPS	1977	USA	---	1.4	1.8	2.4	1.9	---	1.9
NPTS	1983	USA	---	1.3	1.8	2.2	1.7	---	1.8

SOURCE: Reports from individual study areas.

Table D-9

AUTO OCCUPANCY BY TRIP PURPOSE

<u>Study Area</u>	<u>Year</u>	<u>Study Area Description</u>	<u>Home- Based Work</u>	<u>Home- Based Nonwork</u>	<u>Nonhome- Based</u>	<u>Total</u>
Baltimore	1977	T.P.A.	1.20	---	---	---
Chicago	1970	7,593,000	1.20	---	---	1.50
Dallas	1984	T.P.A.	1.13	1.55	1.39	1.36
Honolulu	1981	County	1.20	1.65	1.54	1.52
Kansas City	1970	8 County	1.11	1.61	1.56	1.51
Los Angeles	1976	6 County	1.15	1.71	1.65	1.54
Minn./St. Paul	1982	7 County	1.15	1.40	1.24	1.31
Portland	1977	SMSA	1.13	1.56	1.65	1.50
Sacramento	1978	3 County(-)	1.06	1.54	1.75	1.50
San Diego	1977	County (-)	1.08	1.63	1.58	1.50
San Francisco	1980	9 County	1.07	1.52	1.51	1.41
Tucson	1977	T.P.A.	1.18	1.55	1.37	1.42

SOURCE: Reports from individual study areas.

E. TEMPORAL DISTRIBUTION OF TRAVEL

This section presents statistics on the temporal distribution of person and transit trips over the course of an average weekday. Factors are also presented, however, that can be used to compare or compute the relative magnitude of person trips taken on weekdays versus weekend days by mode and by trip purpose.

Table E-1

HOURLY DISTRIBUTION OF PERSON AND TRANSIT TRIPS
(In Percent)

Hour Beginning ^a	San Francisco (80/81)			NYC (1984)	Phila. (1979)	Chicago (1970)	Miami (1985)
	Vehicle Driver Trips	All Transit Trips	All Trips	Rapid Transit Trips	Rapid Transit Trips	Rapid Transit Trips	Rapid Transit Trips
Midnight	0.3	0.0	0.3	0.8	0.5	0.9	---
1:00 A.M.	0.3	0.1	0.3	0.5	↑	↑	---
2:00	0.3	0.0	0.2	0.3	0.7	1.1	---
3:00	0.2	0.0	0.2	0.3			---
4:00	0.2	0.2	0.1	0.4	↓	↓	---
5:00	1.0	1.0	0.7	1.1	1.2	1.7	---
6:00	2.7	6.1	2.6	5.1	4.6	6.0	6.1
7:00	6.8	13.7	7.1	9.9	13.5	13.3	11.3
8:00	6.3	8.7	7.4	10.6	12.4	12.5	8.1
9:00	4.8	4.7	4.3	6.0	4.9	4.0	4.3
10:00	5.2	3.7	4.6	3.8	3.6	3.0	5.0
11:00	6.1	4.3	5.6	3.1	3.5	2.8	5.5
12:00 Noon	6.9	5.1	6.7	2.8	3.8	2.7	6.4
1:00 P.M.	6.3	4.4	6.2	3.5	4.5	3.1	5.8
2:00	6.7	9.3	7.8	4.9	6.5	4.0	6.6
3:00	8.0	10.2	8.8	6.3	7.1	6.2	7.7
4:00	9.4	10.9	9.1	9.6	11.4	12.5	11.9
5:00	8.6	9.5	8.4	11.1	10.4	13.9	11.7
6:00	5.7	3.1	5.7	6.3	3.8	4.8	4.5
7:00	5.0	1.5	5.1	3.9	2.5	2.3	1.9
8:00	3.2	1.0	3.3	2.6	1.7	1.6	1.4
9:00	2.8	1.0	2.8	2.1	1.4	1.3	1.0
10:00	2.0	0.8	1.8	2.1	1.0	1.2	0.5
11:00 P.M.	1.1	0.6	1.1	1.2	1.0	1.1	0.3
TOTAL	100.0	100.0	100.0	98.3 ^b	100.0	100.0	100.0

Key to Notes

a -- Time of trip determined by time at trip origin.

b -- Does not include certain "high turnstile" (iron maiden) counts.

c -- Based on 24-hour traffic checks at maximum use points on each route (10 locations).

SOURCE: Metropolitan Transportation Commission, 1980 Regional Travel Characteristics -- 1981 MTC Travel Survey (Working Paper 8), June 1983; New York City Transit Authority; Southeastern Pennsylvania Transportation Authority; Chicago Transit Authority; Metro-Dade Transportation Administration.

Table E-2

PEAKING CHARACTERISTICS IN SELECTED AREAS BY MODE

Study Area	Year	Mode	Hour	Percent of 24-h Traffic in Peak Hour (Two Directions)
Manhattan (CBD cordon)	1982	Commuter rail	A.M.	20.6
	1982	Subway	A.M.	17.1
	1982	Bus	A.M.	14.0
Manhattan (midtown)	c.1970	Pedestrian Trips	Noon	11.9
Manhattan (excluding midtown)	c.1970	Pedestrian Trips		
		Department store	Noon	23.8
		Other buildings	P.M.	17.6
		Restaurant	Noon	19.0
		Apartment	P.M.	10.7
New York suburban	c.1970	Auto trips	P.M.	8.8
	c.1970	Taxi trips	A.M.	8.2
New York Chicago, IL	1984	Subway System	P.M.	11.3
	1970	Rapid transit	P.M.	13.9
	1970	Bus	A.M.	11.8
Philadelphia Minn./St. Paul	1979	Rapid Rail	A.M.	15.6
	1982	Bus	A.M.	15.3
		Auto	P.M.	9.7
San Francisco	80/81	All transit	A.M.	13.7
		Auto	P.M.	9.4
Hartford	c. 1970	Bus	P.M.	15.4
New Haven	c. 1970	Bus	P.M.	12.0
Stamford, CT	c. 1970	Bus	P.M.	12.6

SOURCE: B. Pushkarev and J. Zupan, Urban Space for Pedestrians, A Report of the Regional Plan Association, MIT Press, Cambridge, Mass., 1975; B. Pushkarev and J. Zupan, Public Transportation and Land Use Policy, Indiana University Press, Bloomington, Ind., 1977; Chicago Transit Authority, 1970 survey; NYCTA; SEPTA; Transportation studies for Minneapolis and San Francisco.

Table E-3

TYPICAL HOURLY DISTRIBUTIONS OF PEDESTRIAN TRIPS BY STREET TYPE
(In Percent)

<u>Hour Beginning</u>	<u>Office Streets</u>	<u>Retail Streets</u>	<u>Mixed Retail/Office Streets</u>
7:00 A.M.	5.6	1.9	4.1
8:00	10.1	4.1	7.2
9:00	5.2	4.2	5.4
10:00	5.4	4.8	6.2
11:00	7.5	8.0	8.8
12:00 Noon	14.2	13.4	13.1
1:00	11.5	13.6	12.8
2:00	7.7	10.8	9.0
3:00	7.0	10.5	8.7
4:00	11.3	11.7	9.5
5:00	10.9	11.2	10.2
6:00 P.M.	3.6	5.8	5.0
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

SOURCE: L. Kagan et al., A Pedestrian Planning Procedures Manual, Vol. III, Technical Supplement, (FHWA-RD-79-47), November 1978.

Table E-4

HOURLY DISTRIBUTION OF TRANSIT MODE SHARES FOR TRIPS TO/FROM CBD
(In Percent)

Hour Beginning	Denver (1977) ^a	New York (1986) ^b			Minneapolis (1984) ^b
		Bus	Subway	Commuter Rail	
5:00 A.M.	---	3.7	45.1	1.0	---
6:00	24.1	6.6	55.3	5.6	---
7:00	24.2	10.0	60.7	10.8	2.7
8:00	15.2	9.8	64.4	12.2	1.8
9:00	12.7	9.1	59.0	7.4	1.5
10:00	11.5	8.7	48.2	5.6	1.7
11:00	10.1	8.4	44.5	4.1	1.4
12:00 Noon	9.8	7.9	43.4	4.0	1.4
1:00 P.M.	10.8	7.3	42.7	3.4	1.6
2:00	11.7	7.7	43.4	2.8	1.6
3:00	13.3	7.2	47.3	2.2	2.4
4:00	16.5	6.7	51.3	2.0	3.9
5:00	16.6	6.0	48.6	3.2	2.5
6:00 P.M.	7.9	5.6	36.3	3.3	---

Key to Notes

a -- Includes trips entering and leaving CBD.

b -- Inbound trips only.

SOURCE: Barton-Aschman Associates, Downtown Denver Circulation Plan: Denver, Colorado prepared for the Regional Transportation District, September 1977; George Medveczky, Hub-Bound Travel 1986, New York Metropolitan Transportation Council, November 1987; City of Minneapolis, Traffic Engineering Division, Central Business District 1984 Cordon Count, undated.

Table E-5

RATIO OF AVERAGE WEEKDAY TO AVERAGE WEEKEND DAY PERSON TRIPS BY MODE AND TRIP PURPOSE

San Francisco (1980)

<u>Trip Purpose</u>	<u>Mode of Travel</u>				
	<u>Vehicle Driver</u>	<u>Vehicle Passenger</u>	<u>Transit</u>	<u>Walk</u>	<u>Other</u>
Home-Based Work	3.89	3.19	7.94	5.83	4.92
Home-Based Shop	0.98	0.48	1.22	0.93	1.09
Home-Based Soc/Rec	0.53	0.35	0.62	0.59	0.85
Home-Based School	36.67	10.28	60.45	194.76	---
Nonhome-Based	1.64	0.48	1.92	2.99	1.87
TOTAL	1.31	0.54	2.54	1.78	1.83
					1.11

SOURCE: Metropolitan Transportation Commission, 1980 Regional Travel Characteristics -- 1981
MTC Travel Survey (Working Paper 8), June 1983.

F. CBD CHARACTERISTICS AND TRAVEL STATISTICS

This section presents statistics concerning person, vehicle, and truck travel as related to the Central Business Districts (CBDs) of urban areas. It should be noted, however, that there are multiple definitions of the geographic boundaries of a CBD that can have a major influence on the statistics presented. While the CBD area as defined by the Census can be easily ascertained, few areas choose to use this definition as it encompasses too small an area of interest. Where possible, the local acronym for the "central area" (e.g., "Boston Proper") has been used in place of the word "CBD"; however, only the lack of a local convention prevents a wider use of this approach. While much of the data pertains to CBDs, the term might better be translated to mean central, built-up areas of cities. Note also that the definitions used for "Floor Space" vary widely among localities.

Also presented in this section are summaries of cordon counts for persons and vehicular trips taken over an entire day (or nearly so) and during the peak hour. These data tend to be based on actual counts rather than on samples. Comparisons of cordon counts over time are possible if one can be assured that the geographic boundaries are the same. However, the inclusion of an artery or expressway with much thru traffic can distort the comparability of the cordon data. Similarly, because of the traditionally high peaking characteristics of transit trips to the CBD, peak mode shares based on two-way flows will artificially reduce the importance of transit trips compared to measurements based on the one-way peak direction.

Table F-1

CENTRAL BUSINESS DISTRICT CHARACTERISTICS

<u>Study Area</u>	<u>Year</u>	<u>CBD Area (Sq. Miles)</u>	<u>CBD Employment</u>	<u>CBD Employees per Sq. Mile</u>	<u>Floor Space (000 of Sq. Ft.)</u>
Atlanta	1970 ^d	1.20	62,000	51,700	---
Baltimore	1980	1.48	140,000	94,600	10,000
Buffalo	1970 ^d	0.80	41,000	51,250	---
Chicago	1970 ^d	1.55	252,000	162,600	---
Cincinnati	1970 ^d	0.80	53,000	66,250	---
Cleveland	1970 ^d	1.10	74,000	67,300	---
Columbus	1970 ^d	0.90	45,000	50,000	---
Dallas	1984	1.6	115,000	72,000	43,000
Denver	1970 ^d	0.90	45,000	50,000	---
Detroit	1981	1.1	108,000	98,000	---
Houston	1981	1.5	174,000	116,000	58,000
Jacksonville	1983	---	63,000	---	---
Kansas City	1971	0.9	58,000	64,400	31,000
Los Angeles	1970 ^d	2.80	143,000	51,100	---
Miami	1980	0.38	40,810	107,400	---
Milwaukee	1984	1.25	67,440	54,000	20,451 ^a
Minneapolis	1980	0.97	110,050	113,500	---
New Haven	1982	0.52	20,000	38,000	13,000
New York	1982	9.0	2,049,000 ^b	227,700	---
New Orleans	1978	2.69	113,730	42,300	---
Pittsburgh	1970 ^d	0.55	76,000	138,200	---
Portland	1970 ^d	0.40	33,000	82,500	---
Providence	1977	0.5	26,000	52,000	10,000
St. Louis	1978	1.0	102,000	102,000	---
St. Paul	1980	0.37	55,900	64,500	---
San Diego	1980	0.47	38,000	80,800	---
San Francisco	1970	2.2	304,000	138,000	---
Seattle	1980	1.41	115,000	81,600	23,500 ^c
Tampa	1980	0.83	24,500	29,500	7,300
Washington, DC	1970 ^d	1.40	147,000	105,000	---

Key to Notes

a -- Shown is occupied floor space.

b -- Payroll employment.

c -- For 1982.

d -- Source: L. Bronitsky et al., *Urban Data Book*, Report No. DOT-TSC-OST-75-45, Transportation Systems Center, November 1975.

SOURCE: Transportation studies and information furnished by various cities, except where noted.

Table F-2

CENTRAL AREA FLOOR SPACE BY TYPE

Study Area	Year	Study Area Description	Floor Space (000 of Square Feet)					Total
			Residential	Office	Commercial	Public/ Quasi-Public	Wholesale/ Industrial	
Denver	1981	300 Blocks	4,507	18,200	11,144	4,941	3,688	42,480
Jacksonville	1981	"CBD"	N/A	6,299	4,044	1,598	715	12,656
Miami	1980	CBD	1,272	6,565	5,115	---	370	13,322
New Orleans	1974	CBD	N/A	9,400	6,000 ^a	---	---	---
New York	1982	CBD	N/A	283,000	N/A	N/A	N/A	805,000
San Antonio	1982	CBD	1,021	6,598	7,646	5,505	N/A	20,767

Key to Notes

a -- Retail floor space.

SOURCE: Reports from individual study areas.

Table F-3

CBD CORDON COUNTS: ALL-DAY PERSON TRIPS

Study Area	Year	Time Period	Direction	Total	Auto	Rapid Transit	Bus	Railroad	Taxi	Trucks	Motor cycles	Bicycle	Walk	Maximum Accumulation
Boston ^a	1982	6am-12m	Entering	1,007,971	674,276	180,824 ^b	60,167	17,740 ^c	---	26,802	---	---	48,162	200,900
Chicago	1983	7am-7pm	Entering	738,888	223,747	225,253	122,811 ^d	98,907	49,081	19,089	---	---	---	262,000
Denver	1977	6am-7pm	In/Out	496,500	302,225	0	71,145	0	8,703	61,318 ^e	2,390	2,207	48,461	---
Los Angeles	1978	6am-10pm	Entering	677,365	432,517	0	164,520	---	---	33,427	---	---	46,901	150,362
Milwaukee	1982	7am-7pm	In/Out	482,308	361,418	0	89,900	0	f	f	---	---	30,900	---
Minneapolis	1984	6:30a-6:30p	Entering	254,914	159,013	0	58,112	0	3,823	15,742	---	1,274	16,950	66,184
New Orleans	1981	7am-7pm	Entering	236,430	158,830 ^f	---	63,887	0	6,425	6,189	1,099	---	---	48,700
New York	1986	12m-12m	Entering	3,392,015	1,136,643 ^f	1,726,864	267,031	261,477 ^c	f	f	---	---	---	1,471,000
Providence	1976	8am-6pm	In/Out	207,700	158,800	0	33,200	---	---	---	---	---	15,700	25,587
Seattle	1977	12m-12m	In/Out	545,800	426,800	0	119,000	0	---	---	---	---	---	---
Washington ^h	1987	6am-7pm	Entering	1,027,368	739,138 ^g	158,135	109,643	3,530	---	14,423 ^g	2,499 ^g	---	---	---

Key to Notes

a -- Area represents "Boston Proper."

b -- Includes streetcars.

c -- Includes 37,393 ferry and tramway trips.

d -- Includes 9,191 out-of-town buses.

e -- Includes 53,300 light trucks.

f -- Truck and taxi trips included with auto.

g -- Truck and motorcycle occupancy assumed to equal 1.0; light trucks counted with auto.

h -- Area represents "Metro Core."

SOURCE: Reports from individual study areas.

Table F-4

CBD CORDON COUNTS: PEAK-PERIOD PERSON TRIPS

Study Area	Year	Time Period	Direction	Total	Auto	Rapid Transit	Bus	Railroad	Taxi	Trucks	Motor-cycles	Bicycle	Walk
Boston ^a	1982	8am-9am	Entering	121,934	57,044	40,422 ^b	10,201	7,197 ^c	---	2,443	---	---	4,627
Chicago	1983	8am-9am	Entering	152,152	27,198	49,578	28,071	39,755	5,322	2,228	---	---	---
Dallas	1983	7am-9am	Entering	88,093	61,477	0	25,195	0	---	1,421	---	---	---
Denver	1977	4pm-5pm	In/Out	57,106	35,200	0	9,399	0	813	6,069	331	271	5,023
Ft. Worth	1983	7am-9am	Entering	37,831	34,426	0	2,434	0	---	971	---	---	---
Los Angeles	1978	7am-8am	Entering	85,965	47,643	0	30,549	---	---	2,518	---	---	5,255
Minneapolis	1984	7:15-8:15a	Entering	46,492	23,470	0	18,657	0	262	1,456	---	116	2,531
New Orleans	1981	7am-8am	Entering	32,120	20,839	---	10,434	0	281	468	98	---	---
New York	1986	8am-9am	Entering	712,927	88,744 ^e	458,850	69,590	95,743 ^c	e	e	---	---	---
Providence ^f	1976	4:30-5:30p	Leaving	19,426	13,707	0	4,093	---	---	---	---	---	1,626
Washington ^f	1987	7:30-8:30a	Entering	180,695	109,790	42,094	25,044	2,327	---	1,146 ^d	294 ^d	---	---

Key to Notes

a -- Area represents "Boston Proper."

b -- Includes streetcars.

c -- Includes ferry and tramway.

d -- Truck occupancy assumed to equal 1.0

e -- Truck and taxi trips included with auto.

f -- Area represents "Metro Core."

SOURCE: Reports from individual study areas.

Table F-5

CBD CORDON COUNTS: ALL-DAY VEHICLE TRIPS

Study Area	Year	Time Period	Direction	Total	Auto	Rapid Transit	Bus	Railroad	Taxi	Trucks	Motor-cycles	Maximum Accumulation
Boston ^a	1982	6am-12m	Entering	498,552	473,252	---	2,452	---	---	22,848	---	59,100
Chicago	1983	7am-7pm	Entering	207,169	159,820	---	5,609	---	25,833	15,907	---	28,500
Denver	1977	6am-7pm	In/Out	290,852	227,477	0	6,036	0	5,282	49,805	2,252	28,400
Detroit	1974	7am-7pm	In/Out	260,196	232,299	---	4,973	---	---	22,924	---	---
Los Angeles	1978	6am-10pm	Entering	351,105	312,100	0	5,578	---	---	33,427	---	68,088
Milwaukee	1982	12m-12m	Entering	171,253	168,969	0	2,284	0	b	b	---	30,300
Minneapolis	1984	6:30a-6:30p	Entering	145,113	124,224	0	3,047	0	2,100	15,742	---	27,000
New Orleans	1981	7am-7pm	Entering	127,148	113,761	---	2,770	0	4,263	5,352	1,002	23,900
New York	1986	12m-12m	Entering	796,330	741,865 ^b	39,257	11,286	3,922	b	b	---	105,900
Providence	1976	8am-6pm	In/Out	126,200	112,900	0	---	---	---	---	---	---
Washington ^d	1987	6am-7pm	Entering	564,337	539,856 ^c	3,539	4,020	---	---	14,423 ^c	2,499	---

Key to Notes

a -- Area represents "Boston Proper."

b -- Truck and taxi trips included with auto.

c -- Light truck included with auto.

d -- Area represents "Metro Core."

SOURCE: Reports from individual study areas.

Table F-6

CBD CORDON COUNTS: PEAK-PERIOD VEHICLE TRIPS

Study Area	Year	Time Period	Direction	Total	Auto	Rapid Transit	Bus	Railroad	Taxi	Trucks	Motor-cycles
Boston ^a	1982	8am-9am	Entering	43,981	41,944	---	---	---	---	2,037	---
Chicago	1983	8am-9am	Entering	24,942	19,427	---	8,579	---	2,801	1,857	---
Dallas	1983	7am-9am	Entering	48,839	46,798	0	620	0	---	1,421	---
Denver	1977	4pm-5pm	In/Out	31,492	25,180	0	638	0	4,866	495	313
Ft. Worth	1983	7am-9am	Entering	28,973	27,874	0	128	0	---	971	---
Los Angeles	1978	7am-8am	Entering	38,684	35,500	0	666	---	---	2,518	---
Milwaukee	1982	7am-8am	Entering	19,811	19,576 ^b	0	235	0	b	b	---
Minneapolis	1984	7:15a-8:15a	Entering	20,449	18,335	0	517	0	141	1,456	---
New Orleans	1981	7am-8am	Entering	15,260	14,260	---	299	0	223	389	89
New York	1986	8am-9am	Entering	60,872	54,968 ^b	3,337	1,722	845	b	b	---
Providence ^d	1976	4:30p-5:30p	Leaving	10,082	9,558	0	141	---	---	---	---
Washington	1987	7:30a-8:30a	Entering	78,791	76,198	500	653	---	---	1,146 ^c	294

Key to Notes

- a -- Area represents "Boston Proper."
- b -- Truck and taxi trips included with auto.
- c -- Light trucks included with auto.
- d -- Area represents "Metro Core."

Table F-7

PEAK-HOUR PERSON TRIPS BY TRANSIT TO CENTRAL BUSINESS DISTRICTS

City Rank 1980 Census	Study Area	1980 City Population (000s)	Year of Count	Peak-Hour One-Way Persons (000s)	Peak-Hour Percent Auto/Other	Percent Transit
1	New York	7,072	1971 1974 1986	805 738 713	8 10 12	92 90 88
2	Chicago	3,005	1971 1974 1983	210 200 152	19 18 23	81 82 77
3	Los Angeles	2,967	1970 1974 1980	99 93 88	69 63 64	31 37 36
5	Houston	1,595	1971 1980	55 66	36 82	14 18
6	Detroit	1,203	1974	39	67	35
7	Dallas	904	1971 1983	50 88	72 71	28 29
11	San Antonio	786	1979	21	73	27
15	Washington, DC	638	1983	169	68	32

Table continued on following page.

Table F-7 (Continued)

PEAK-HOUR PERSON TRIPS BY TRANSIT TO CENTRAL BUSINESS DISTRICTS

City Rank 1980 Census	Study Area	1980 City Population (000s)	Year of Count	Peak-Hour One-Way Persons (000s)	Peak-Hour Percent	
					Auto/Other	Transit
20	Boston	563	1972	143	50	50
			1974	131	51	49
			1983	122	53	47
21	New Orleans	558	1981	32	68	32
24	Denver	492	1977	34	70	30
33	Ft. Worth	385	1977	22	93	7
			1983	38	94	6
34	Minneapolis	371	1984	46	60	40
41	Miami	347	1985	29	76	24
99	Providence	157	1977	19 ^a	79 ^a	21 ^a
125	New Haven	126	1982	19	78	22

Key to Notes

a -- Based on trips leaving CBD in P.M.

SOURCE: Reports from individual study areas.

Table F-8

CBD TRIP GENERATION RATES FOR THE PEAK MIDDAY HOUR

Los Angeles (1975)

<u>Land-Use Type</u>	<u>Trip Generation Rate (nonworker trips produced per thousand square feet of building area during peak noontime hour)</u>
Private Office	0.4
Government Office	0.4
Retail	1.9
Service, Hotel, Institutional	0.5
Manufacturing, Wholesaling	0.1

SOURCE: Barton-Aschman Associates, Internal CBD Travel Demand Modeling, Task 45 Report prepared for the Los Angeles Community Redevelopment Agency, August 1976.

Table F-9

CBD PEDESTRIAN TRIP RATES

Type of Use	Location	Gross Floor Space (Ft ²)	Hours	Destinations or Arrivals/ 1,000 Ft ²	Source
Urban Office Buildings					
Mixed use	Manhattan	314,000	24	8.7	(1)
Headquarters	Manhattan	1,634,000	24	7.1	(1)
Headquarters	Manhattan	1,048,000	24	6.6	(1)
24 buildings	Seattle	5,241,000	24	7.7	(1)
40 Westminster (general)	Providence	286,000	7 A.M.-6 P.M.	10.3	(2)
Industrial Ntl. Bank (general)	Providence	350,000	7 A.M.-6 P.M.	13.7	(2)
Hosp. Trust (general)	Providence	538,000	7 A.M.-6 P.M.	13.1	(2)
Providence Journal (specialized)	Providence	162,000	7 A.M.-6 P.M.	14.2	(2)
State Capitol	Providence	146,000	7 A.M.-5 P.M.	8.9	(2)
Seven Office Bldgs.	Downtown Boston	11,600,000	7 A.M.-6 P.M.	7.5 ^a	(3)
Restaurants					
Cafeteria	57th Street	7,200	10 A.M.-8 P.M.	246.0	(1)
Sandwich shop	Garment District	1,000	6 A.M.-3 P.M. ^b	215.0	(1)
Restaurant	Times Square	12,000	9 A.M.-9 P.M.	86.5	(1)
Urban Retail Stores					
Delicatessen	Manhattan	2,500	10 A.M.-10 P.M. ^c	1,230.0	(1)
Supermarket	Staten Island	7,500	9 A.M.-9 P.M.	142.5	(1)
Supermarket	Manhattan	5,100	9 A.M.-6 P.M. ^c	254.5	(1)
Supermarket	Manhattan	14,500	9 A.M.-9 P.M. ^b	186.5	(1)
Junior dept. store	Manhattan	69,600	9 A.M.-9 P.M. ^b	192.5	(1)
Dept. store	Manhattan	176,700	9 A.M.-9 P.M. ^b	126.0	(1)
Boutique	Manhattan	3,400	11 A.M.-7 P.M. ^b	102.5	(1)
Dept. store	Providence	431,000	8:45 A.M.-6 P.M. ^b	244.0	(1)
Dept. store	Boston	792,000	7 A.M.-6 P.M.	18.3 ^a	(2)
Hotel	Boston	644,000	7 A.M.-6 P.M.	4.3 ^a	

Key to Notes

a -- "Primary" destinations.

b -- Weekday.

c -- Saturday.

SOURCE: (1) B. Pushkarev and J. Zupan, Urban Space for Pedestrians, A Report of the Regional Plan Association, MIT Press, Cambridge, Mass., 1975. (2) Downtown Providence Traffic, Circulation and Development Study, Wilbur Smith and Associates, New Haven, Conn., 1978. (3) Final Report, An Access Oriented Parking Strategy for the Boston Metropolitan Area, Wilbur Smith and Associates, New Haven, Conn., 1972.

Table F-10

CBD PERSON TRIP DESTINATIONS BY PURPOSE AND MODE
(In Percent)

Study Area	Year	Mode	Purpose at Trip Destination					
			Work	Business	Shop	Rec.	Social/ School	Other
Boston	1972	All	55	-----45-----				
Milwaukee	1972	All Modes	50	22	9	9	6	4
Milwaukee	1972	Auto Drive	54	24	5	9	5	3
Milwaukee	1972	Auto Passenger	39	28	9	17	3	4
Milwaukee	1972	Bus	50	11	21	3	11	4
Minneapolis	1974	All	47	21	10	10	---	12
Providence	1977	All	37	36	18	a	---	9

Key to Notes

a -- Included in business

SOURCE: S. Sullivan and J. Lusk, "Characteristics of Travel in the Milwaukee Central Business District, 1963 and 1972." Southeastern Wisconsin Regional Planning Commission, The Technical Record, Vol. 3, No. 6, April 1976; Reports from individual study areas.

Table F-11

VEHICLE OCCUPANCIES FOR CBD-BOUND TRIPS BY MODE

<u>Study Area</u>	<u>Year</u>	<u>Time Period</u>	<u>Direction</u>	<u>Auto</u>	<u>Bus</u>	<u>Taxi</u>	<u>Truck</u>	<u>Motorcycle</u>
Boston	1982	6:00A-12:00M	Entering	1.42	24.5	---	1.17	---
Chicago	1983	7:00A-7:00P	Entering	1.40	21.90	1.90	1.20	---
Dallas	1983	7:00A-9:00A	Entering	1.31	40.64	---	---	---
Denver	1977	6:00A-7:00P	In/Out	1.33	11.79	1.65	1.23	1.06
Ft. Worth	1983	7:00A-9:00A	Entering	1.24	19.02	---	---	---
Los Angeles	1978	6:00A-10:00P	Entering	1.39	29.49	---	---	---
Milwaukee	1982	12:00M-12:00M	In/Out	1.35	19.54	---	---	---
Minneapolis	1984	6:30A-6:30P	Entering	1.28	19.1	1.82	---	---
New Orleans	1981	7:00A-7:00P	Entering	1.40	23.06	1.51	1.16	1.10
New York	1982	12:00M-12:00M	Entering	1.52	30.32	1.82	1.38	---
Providence	1976	4:30P-5:30P	Leaving	1.40	29.0	---	---	---
Seattle	1977	12:00M-12:00M	In/Out	1.35	---	---	---	---
Washington ^a	1983	6:00A-7:00P	In/Out	1.41	26.0	---	---	---

F-13

Key to Notes

a -- Area represents "Metro Core."

SOURCE: Reports from individual study areas.

Table F-12

TRANSIT SHARE OF CBD-BOUND WORK TRIPS
(In Percent)

<u>Study Area</u>	<u>1970</u>	<u>1980</u>
Anaheim/Santa Ana/Garden Grove	1.1%	3.4%
Boston	60.6	58.5
Chicago	74.9	74.1
Dallas/Fort Worth	19.9	19.2
Houston	12.9	15.0
Los Angeles/Long Beach	21.4	23.8
San Diego	8.7	13.7
San Francisco/Oakland	47.9	52.4
St. Louis	29.7	26.7
Washington, DC	36.5	42.6

SOURCE: Urban Mass Transportation Administration, The Status of the Nation's Local Public Transportation: Conditions and Performance, Report to Congress under Section 310, September 1984, based on U.S. Census Journey to Work data.

Table F-13

PARKING CHARACTERISTICS FOR SELECTED CBD AND URBAN AREAS

<u>Study Area</u>	<u>Year</u>	<u>Study Blocks</u>	<u>Total Spaces</u>	<u>Peak Accumulation</u>	<u>Percent Accumulation</u>	<u>Average Walking Distance</u>	<u>Average Duration</u>
Boston	1972	340	39,230	36,120	90.9	895 ft.	4H:40M
Cleveland	1978	2.0 mi ²	53,912	39,700	73.6	671 ft.	4H:17M
Dallas	1981	1.6 mi ²	59,616	49,600	83.1	---	---
Denver	1981	300	60,568	---	---	---	---
Honolulu	1980	100	20,070	---	---	1.7 bks.	---
Kansas City	1978	CBD	30,846	---	---	---	---
Jacksonville	1981	200	31,517	21,953	69.7	285 ft.	3H:37M
Memphis	1981	CBD	16,986	12,253	72.1	---	---
Milwaukee	1972	CBD	30,707	28,142	92.	---	---
Philadelphia	1977	CBD	41,684	---	---	---	---
San Diego	1981	CBD	15,545	---	---	---	---
Seattle	1980	100	42,508	---	---	---	---
Tampa	1983	173	20,841	17,740	85.	560 ft.	---

SOURCE: Reports from individual study areas.

Table F-14

TRIP PURPOSE OF PARKERS IN SELECTED CBD AND URBAN AREAS

<u>Study Area</u>	<u>Year</u>	<u>Study Blocks</u>	<u>Trip Purpose (%)</u>				
			<u>Work</u>	<u>Shop</u>	<u>Business</u>	<u>Sales</u>	<u>Other</u>
Baltimore	1969	---	30	13	41	-----16-----	
Boston	1972	340	36	15	-----49-----		
Cleveland	1978	---	40	10	-----40-----		
Jacksonville	1981	200	41	7	38	1	13
Milwaukee	1972	CBD	59	5	17 ^a	-----19-----	
Tampa	1983	173	45	9	-----46-----		

Key to Notes

a -- Personal business.

SOURCE: Reports from individual study areas.

Table F-15

CENTRAL BUSINESS DISTRICT TRUCK TRIPS

<u>Study Area</u>	<u>Year</u>	<u>Study Area Population (Millions)</u>	<u>CBD Floor Space (Mil. Sq. Ft.)</u>	<u>CBD Truck Trips (000)</u>	<u>CBD Truck Trips per 1,000 People</u>	<u>Truck Trips To, From, Within CBD/1,000 ft² of Floor Space</u>
Baltimore	1962	1.6	33	22	14	0.667
Dallas	1964	1.8	31	27	15	0.871
Los Angeles	1960	7.6	76	31	4	0.431
Philadelphia	1960	4.0	124	43	11	0.330
Pittsburgh	1958	1.5	32	19 ^a	13	0.594
St. Louis	1957	1.3	39	19	15	0.487

Key to Notes

a -- same for 1967.

SOURCE: Comprehensive origin-destination studies in each urban area.

Table F-16

CBD TRUCK STOPS FOR VARIOUS LAND USES

<u>Type of Establishment</u>	<u>Average Daily Truck Stops per 1000 Ft² of Floor Space^a</u>	
	<u>Range</u>	<u>Typical Value</u>
Office	0.15-0.24	0.20
Retail		
Apparel	0.18-0.67	0.45
Department	0.14-0.37	0.25
Furniture	0.19-0.60	0.30
Restaurant	2.70-6.10	3.60
Hotel	0.03-0.20	0.10
Manufacturing	0.35-0.68	0.50
Warehousing	0.35-0.53	0.50

Key to Notes

a -- Truck "stop" is equivalent to a visit to a particular establishment.

SOURCE: Adapted from H. S. Levinson and P. E. Conrad, "Urban Truck Road Systems and Travel Restrictions," Vol. 2, Appendices, prepared for FHWA by Wilbur Smith and Associates, Columbia, S.C., 1975.

G. TRUCK TRAVEL

This section presents nearly all the data in the report concerning truck travel (exceptions are certain tables in Sections D and F). Following the basic outline used for the entire report, statistics are presented for average truck trip rates per day, average trip length, percentage of trips that are trucks, trip rates by trip purpose, and hourly variation of truck trips for all trips and by facility type. Many of the data are drawn from studies conducted in the 1960s as, unfortunately, very few studies of this kind have been undertaken since that time.

Table G-1

AVERAGE DAILY TRUCK TRAVEL IN ELEVEN URBAN AREAS^a

Truck Trip Category	Truck Class		Total
	Light	Medium/Heavy	
Trucks Making Trips			
Number	72,989	28,691	101,680
Percent	71.8	28.2	100.0
Daily Trips			
Number	608,606	289,810	898,416
Percent	67.7	32.3	100.0
Daily Truck-Miles			
Number	2,075,660	1,104,742	3,180,402
Percent	65.3	34.7	100.0
Daily Mileage			
Per Truck	28.4	36.5	31.3
Per Trip	3.4	3.8	3.5
Daily Trips Per Truck ^b	8.3	10.1	8.8

Key to Notes

a -- Shown are summations of trip values for the following 11 areas:

Albuquerque, New Mexico (1962); Baltimore, Maryland (1962); Baton Rouge, Louisiana (1965); Columbia, South Carolina (1965); Lewiston, Maine (1964); Little Rock, Arkansas (1964); Manchester, New Hampshire (1964); Monroe, Louisiana (1965); Richmond, Virginia (1964); Sioux Falls, South Dakota (1963); and Winston-Salem, North Carolina (1965).

b -- These values are for trucks making trips on a typical weekday. When related to all trucks registered in the urban area, the average is 5.9 trips per day, since a proportion of the registered trucks are idle on any given day.

SOURCE: Wilbur Smith and Associates, Motor Trucks in the Metropolis, The Automobile Manufacturers Association, August 1969, p. 29.

Table G-2

DAILY TRUCK TRAVEL IN ELEVEN URBAN AREAS
BY CATEGORY OF USER AND TRUCK CLASS^a

User Category	Percent of Trucks Making Trips			Percent of Daily Trips			Percent of Daily Vehicle Miles		
	Light	Heavy	All	Light	Heavy	All	Light	Heavy	All
<u>Industry</u>									
Agriculture	1.8	2.1	1.9	1.5	1.4	1.5	1.7	1.8	1.8
Construction	20.2	12.5	17.6	11.1	6.9	9.7	20.2	11.7	17.3
Manufacturing- Processing	4.4	11.8	6.5	9.4	13.5	10.8	5.8	11.2	7.7
Transportation-Public Utilities	6.2	23.3	11.0	12.0	16.5	13.4	7.4	25.2	13.5
Wholesale-Retail Trade	20.7	36.4	25.3	33.2	45.6	37.3	26.9	37.0	30.3
Service and Recreation	10.2	4.4	8.6	15.9	4.6	12.2	12.4	3.2	9.2
<u>Government</u> (Public Service)	2.8	6.5	3.9	3.8	9.1	5.5	3.7	7.4	5.0
<u>Personal Use</u>	33.8	3.0	5.2	13.1	2.4	9.6	21.9	2.5	15.2
All Users	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Key to Notes

a -- See Note a on Table G-1.

SOURCE: Wilbur Smith and Associates, Motor Trucks in the Metropolis, The Automobile Manufacturers Association, August 1969, p. 38.

Table G-3

TRIP PURPOSES OF URBAN TRUCK TRIPS IN ELEVEN URBAN AREAS^a

<u>Trip Purpose at Destination</u>	<u>Percent of Total Daily Trips</u>
Home Base	19.3
Personal Use	9.1
All Pickup and Delivery:	41.1
Retail	17.3
Wholesale	16.3
Merchandise	7.5
Mail and Express	6.1
Construction	4.9
Maintenance and Repair	8.0
Business Use	7.2
Other	<u>4.3</u>
All Purposes	100.0

Key to Notes

a -- Shown are summations of trip values for the following 11 areas:

Albuquerque, New Mexico (1962); Baltimore, Maryland (1962); Baton Rouge, Louisiana (1965); Columbia, South Carolina (1965); Lewiston, Maine (1964); Little Rock, Arkansas (1964); Manchester, New Hampshire (1964); Monroe, Louisiana (1965); Richmond, Virginia (1964); Sioux Falls, South Dakota (1963); and Winston-Salem, North Carolina (1965).

SOURCE: Wilbur Smith and Associates, Motor Trucks in the Metropolis, The Automobile Manufacturers Association, August 1969, p. 46.

Table G-4

TRUCK TRIP LENGTHS
(Miles/Minutes)


<u>Study Area</u>	<u>Year</u>	<u>Study Area Description</u>	<u>Type of Truck</u>				<u>Measure</u>
			<u>Light</u>	<u>Medium</u>	<u>Heavy</u>	<u>All</u>	
Baltimore	1962	1,607,800	3.0	3.0	7.3	3.2	Miles
Chicago	1970	7,593,000	4.4	6.5	11.2	5.3	Miles
Milwaukee	1972	7 County	---	---	---	7.3	Miles
New York	1963	16,302,000	2.8	4.9	13.4	2.9	Miles
Philadelphia	1977	SMSA (+)	9.8	---	14.4	---	Minutes
Richmond	1964	417,600	3.0	3.1	7.2	3.1	Miles
Washington, DC	1980	SMSA (-)	---	---	---	9.8	Miles

SOURCE: Reports from individual study areas.

Table G-5

AVERAGE TRUCK TRIP LENGTH BY TRIP PURPOSE
(In Miles)

Chicago 1970

<u>Trip Purpose</u>	<u>Internal Trips</u>	<u>Internal- External</u>	<u>Through Trips</u>
Pickup	4.9	27.4	74.1
Deliver	4.1	34.5	77.2
Pickup and Deliver	3.5	31.5	75.5
Garage-Home base	8.7	32.7	78.0
Service Call	4.4	16.0	48.1
Personal Use	<u>6.3</u>	<u>18.1</u>	<u>69.9</u>
Average (Weighted)	5.3	29.8	75.7
Percent of VMT	77%	 23%	

SOURCE: Chicago Area Transportation Study and Northwestern Indiana Regional Planning Commission, A Summary of Travel Characteristics, 1977.

Table G-6

TRUCK TRIP DESTINATIONS BY LAND-USE TYPE

<u>Land Use</u>	<u>Daily Truck Trips per Acre</u>	
	<u>Median</u> <u>7 Cities</u>	<u>Range</u>
Residential	1.2	0.1-2.0
Manufacturing	2.5	0.4-5.9
Transportation	1.7	0.9-4.0
Retail-Wholesale Trade	16.0	10.3-35.0
Services, Schools, Etc.	3.0	2.6-5.2
All Developed Land	1.3	0.6-3.5

SOURCE: Transportation studies in Monroe, LA (1965); Columbia, SC (1965); Little Rock, AR (1964); Baton Rouge, LA (1965); Richmond, VA (1964); Nashville, TN (1959); Chicago, IL (1959).

Table G-7

HOURLY VARIATION IN WEEKDAY TRUCK TRIPS
(In Percent)

<u>Hour Beginning</u>	<u>Average for 11 Cities^a</u>			<u>San Antonio (1981)</u>
	<u>Light Trucks</u>	<u>Medium- Heavy Trucks</u>	<u>Total - All Truck Types</u>	
6:00 A.M.	3.0	3.3	3.1	2.7
7:00	6.2	6.6	6.3	7.8
8:00	8.5	10.2	9.1	10.6
9:00	9.5	10.8	9.9	9.4
10:00	9.7	10.7	10.0	9.1
11:00	9.4	10.2	9.7	9.4
12:00 NOON	7.4	7.0	7.3	3.7
1:00 P.M.	8.4	8.8	8.6	3.7
2:00	8.0	8.2	8.0	9.4
3:00	7.2	7.4	7.3	9.7
4:00	7.7	6.0	7.1	7.8
5:00	5.7	3.1	4.8	4.6
6:00 P.M.	2.5	1.0	2.0	4.4
7:00 P.M. - 5:00 A.M.	<u>6.8</u>	<u>6.7</u>	<u>6.8</u>	<u>7.7</u>
TOTAL	100.0	100.0	100.0	100.0

Key to Notes

a -- Shown are summations of trip values for the following 11 areas:

Albuquerque, New Mexico (1962); Baltimore, Maryland (1962); Baton Rouge, Louisiana (1965); Columbia, South Carolina (1965); Lewiston, Maine (1964); Little Rock, Arkansas (1964); Manchester, New Hampshire (1964); Monroe, Louisiana (1965); Richmond, Virginia (1964); Sioux Falls, South Dakota (1963); and Winston-Salem, North Carolina (1965).

SOURCE: Wilbur Smith and Associates, Motor Trucks in the Metropolis, The Automobile Manufacturers Association, August 1969, p. 185; State Department of Highways and Public Transportation, San Antonio - Bexar County Highway Travel Facts and Figures, September 1982, p. 26.

Table G-8

HOURLY DISTRIBUTION OF TRUCK TRIPS BY FACILITY TYPE
(7-County Detroit Area, 1982)

<u>Hour Beginning</u>	<u>Urban Freeways</u>	<u>Urban Arterials</u>	<u>Rural Freeways</u>	<u>Rural Arterials</u>
12:00 Mid.	1.7	0.8	1.8	0.5
1:00 A.M.	1.5	0.7	1.4	0.5
2:00	1.7	0.5	1.4	0.5
3:00	0.8	0.4	1.2	0
4:00	1.5	0.5	1.6	0.5
5:00	2.1	1.8	4.2	2.7
6:00	4.2	3.7	5.2	7.6
7:00	5.5	4.4	7.0	9.1
8:00	5.5	7.8	5.3	6.9
9:00	6.2	7.2	5.4	5.8
10:00	6.5	7.1	6.0	5.2
11:00	5.0	7.4	6.0	5.3
12:00 Noon	5.5	7.1	5.7	5.2
1:00 P.M.	5.6	6.0	6.0	5.7
2:00	6.1	6.1	7.1	7.0
3:00	9.4	7.2	7.0	7.6
4:00	9.0	8.3	5.7	7.1
5:00	6.0	6.4	5.3	5.8
6:00	4.6	3.7	3.9	4.8
7:00	2.8	3.5	3.2	2.7
8:00	2.6	3.3	2.7	2.9
9:00	2.3	2.8	2.9	2.7
10:00	2.1	1.7	2.4	2.0
11:00	<u>1.8</u>	<u>1.6</u>	<u>1.6</u>	<u>1.9</u>
TOTAL	100.0	100.0	100.0	100.0

SOURCE: Carmine Palombo (Southeast Michigan Council of Governments), Regional Vehicle Classification and Occupancy Study, November 1982.

H. TRANSIT USAGE STATISTICS

This section presents statistics on the usage characteristics of transit facilities. Annual ridership data and selected productivity statistics (e.g., person trips per revenue car mile operated) are reported for all commuter rail, rapid transit, light rail transit, and streetcar systems and for major bus systems. Ridership data for recently-opened rail and DPM systems are shown separately. Peak-hour volumes on selected lines are also reported for various rapid transit, light rail, and streetcar systems. Mode of access at the systemwide level and by selected stations/terminals are reported. Note that access modes in the morning (at outlying stations) are much different than access modes (at center city stations) on the return trip in the evening. Thus, access mode shares can be expected to vary significantly depending on whether they are given as AM inbound only, systemwide, and/or by station or terminal. The distribution of access modes at stations and terminals is heavily dependent on parking availability and cost, feeder bus service, and neighborhood characteristics.

Table H-1

COMMUTER RAIL RIDERSHIP STATISTICS FOR PRINCIPAL LINES AND BRANCHES

Study Area (Year)	Distance to CBD (Miles)	Annual Ridership	Passengers per Revenue Car Mile	Passenger Miles per Revenue Car Mile
<u>Boston (1987)^b</u>				
Attleboro/Stoughton	32/19	3,729,232	—	—
Franklin	28	1,950,696	1.94	33.9
Framingham	21.5	1,344,172	—	—
Lowell	24.5	1,771,436	—	—
Gardner/Fitchburg	55	1,564,180	1.50	26.4
Haverhill	33	1,532,005	—	—
Ipswich/Rockport	35	2,452,830	—	—
System Total ^a		14,344,551	1.68	29.6
<u>Chicago (1987)^c</u>				
Aurora (Burlington Northern)	38	12,385,789	3.97	78.1
Kenosha (Chicago & North Western)	52	6,258,875	2.59	48.3
Harvard (Chicago & North Western)	63	9,043,659	2.48	60.0
Geneva (Chicago & North Western)	35.5	6,973,419	3.49	77.6
South Bend (Chicago, South Shore, & South Bend)	88	3,042,250	1.51	42.1
University Park and Branches (Illinois Central Gulf)	31.5	11,156,963	3.51	70.1
Joliet (Illinois Central Gulf)	37	434,440	3.28	77.8
Orland Park (Norfolk & Western)	24	1,202,223	5.57	90.9
Fox Lake (NIRC Milwaukee District)	50	4,285,853	2.23	54.8
Elgin (NIRC Milwaukee District)	37	4,529,568	2.94	64.6
Joliet (NIRC Rock Island District)	40	7,192,226	3.64	65.7
System Total		66,505,265	3.00	63.5

Table continued on following page.

Table H-1 (Continued)

COMMUTER RAIL RIDERSHIP STATISTICS FOR PRINCIPAL LINES AND BRANCHES

Study Area (Year)	Distance to CBD (Miles)	Annual Ridership	Passengers per Revenue Car Mile	Passenger Miles per Revenue Car Mile
New Jersey (FY 1987) ^{d,h}				
Main/Bergen (NJ)	31	4,559,500	0.95	17.2
Main/Bergen (NY/MTA)	71	701,500	---	---
Boonton	48	1,697,600	1.52	25.6
Gladstone	42	1,239,400	1.04	19.8
Montclair	12	324,500		
Morristown	40	6,269,500		
Pascack Valley (NJ)	27	1,650,800	2.18	36.4
Pascack Valley (NY/MTA)	33	499,000	---	---
Raritan Valley	54	3,884,800	1.19	22.2
North Jersey Coast	67	5,963,300	0.98	33.3
Northeast Corridor (less NEC Adj.)	58	17,107,200	1.46	36.7
System Total		43,897,100	1.2	28.2
New York (1987)				
Metro-North				
Dover Plains (Harlem)	77	18,527,000 ^e	2.06	46.8
Poughkeepsie (Hudson)	72	9,880,000 ^e	1.40	41.6
New Haven (New Haven) ⁱ	72	23,395,000 ^e	1.60	48.2
LIRR	117	74,938,000 ^{e,k}	1.41	38.7
SIRTOA	14 ^j	6,442,000	3.1	21.7
MTA Total		135,182,000	1.6	41.1

Table continued on following page.

Table H-1 (Continued)

COMMUTER RAIL RIDERSHIP STATISTICS FOR PRINCIPAL LINES AND BRANCHES

<u>Study Area (Year)</u>	<u>Distance to CBD (Miles)</u>	<u>Annual Ridership</u>	<u>Passengers per Revenue Car Mile</u>	<u>Passenger Miles per Revenue Car Mile</u>
<u>Philadelphia (FY1987)^f</u>				
Airport Line	9	486,200	---	---
Chestnut Hill East	12	1,188,300	---	---
Chestnut Hill West	12	1,457,800	---	---
Lansdale-Doylestown	35	2,697,500	---	---
Fox Chase	12	990,500	---	---
Ivy Ridge	8	247,200	---	---
Media/West Chester	28	2,646,000	---	---
Marcus Hook	16	1,797,700	---	---
Norristown	19	1,101,900	---	---
Paoli	19	6,268,900	---	---
Trenton	33	1,947,000	---	---
Warminster	21	1,464,100	---	---
West Trenton	34	1,860,900	---	---
System Total		24,154,000	2.31	31.4
<u>Pittsburgh (FY1987)</u>				
Versailles (CSX)	18	236,000	0.9	15.5

Table continued on following page.

Table H-1 (Continued)

COMMUTER RAIL RIDERSHIP STATISTICS FOR PRINCIPAL LINES AND BRANCHES

<u>Study Area (Year)</u>	<u>Distance to CBD (Miles)</u>	<u>Annual Ridership</u>	<u>Passengers per Revenue Car Mile</u>	<u>Passenger Miles per Revenue Car Mile</u>
<u>San Francisco (FY 1987)</u>				
San Jose (Southern Pacific)	47	5,421,552	2.32	54.9
<u>Washington, DC (FY 1987)⁸</u>				
Baltimore (Amtrak)	40	713,174	---	---
Baltimore (CSX)	37	336,958	---	---
Martinsburg (CSX)	73	<u>772,372</u>	---	---
System Total		1,822,504	1.38	30.0

Key to Notes

- a -- Does not include Needham and Fairmount branches which resumed service in October 1987.
b -- Divide by 270 to get Average Weekday Rides.
c -- Divide by 255 to get Average Weekday Rides.
d -- Divide by 260 to get Average Weekday Rides.
e -- Divide by 285 to get Average Weekday Rides.
f -- Divide by 275 to get Average Weekday Rides.
g -- Divide by 252 to get Average Weekday Rides.
h -- Measures based on total car miles instead of revenue car miles.
i -- Includes New Canaan, Danbury, and Waterbury branches.
j -- Line length.
k -- Estimated; actual rides were 4% less due to 2-week strike in 1987.

SOURCE: Individual rail systems or transportation agencies, except where noted.

Table H-2

RAIL RAPID TRANSIT: RIDERSHIP AND SYSTEM PROFILES (1986)

Study Area	System	Directional Route Miles (One-Way)	Number of Stations	Maximum Revenue Vehicles in Service	Annual Revenue VMT (000s)	Annual Unlinked Rides (000s)	Unlinked Rides per Station (Avg. Weekday ^a)	Unlinked Rides per VMT
Atlanta	(MARTA)	51.5	25	115	11,741	65,548	8,740	5.6
Baltimore	(MTA)	14.4	9	42	1,792	11,567	4,280	6.5
Boston	(MBTA)	76.6	50	252	17,543	143,747	9,580	8.2
Chicago	(CTA)	191.0	143	925	46,401	145,348	3,390	3.1
Cleveland	(RTA)	38.2	18	35	2,065	5,671	1,050	2.7
Lindenwold	(PATCO)	30.5	12	90	3,829	10,367	2,880	2.7
Miami	(DCTA)	39.7	20	66	4,442	7,668	1,280	1.7
New Jersey	(PATH)	27.6	13	241	11,344	53,794	13,790	4.7
New York City	(NYCTA)	481.2	463	4,889	290,493	1,591,526	11,460	5.5
Philadelphia	(SEPTA)	80.4	74	283	15,572	88,357	3,980	5.7
San Francisco	(BART)	142.0	34	321	30,490	63,959	6,270	2.1
Washington	(WMATA)	139.1	64	446	26,859	145,149	7,560	5.4

Key to Notes

a -- Average weekday trips computed by dividing annual trips by 300. Note that this statistic may be deceptively high for systems with relatively large numbers of rail-to-rail transfers.

SOURCE: U.S. Department for Transportation, National Urban Mass Transportation Statistics, 1986 Section 15 Annual Report (UMTA-VA-06-0127-88-1), June 1988; computations by Charles River Associates.

Table H-3

STREETCAR AND LIGHT RAIL TRANSIT: RIDERSHIP AND SYSTEM PROFILES (1986)

Study Area	System	Directional Route Miles (One-Way)	Maximum Revenue Vehicles in Service	Annual Revenue VMT (000s)	Annual Unlinked Rides (000s)	Unlinked Rides per VMT
Boston	(MBTA)	55.9	116	1,078	16,235	15.1
Buffalo	(NF)	10.4	21	505	4,020	8.0
Cleveland	(RTA)	26.0	28	1,082	4,642	4.3
Newark	(NJT)	8.3	16	574	3,804	6.6
New Orleans	(RTA)	13.2	22	668	7,258	10.9
Philadelphia	(SEPTA)	165.7	174	5,532	41,887	7.6
Pittsburgh	(PAT)	29.8	51	1,335	6,041	4.5
San Diego	(Trolley)	41.0	23	1,831	5,300	2.9
San Francisco	(Muni)	47.1	110	4,067	38,934	9.6
Seattle	(MMS)	3.2	2	34	232	6.8

SOURCE: U.S. Department of Transportation, National Urban Mass Transportation Statistics, 1986 Section 15 Annual Report
(UMTA-VA-06-0127-88-1), June 1988.

Table H-4

BUS TRANSIT (LARGE SYSTEMS): RIDERSHIP AND SYSTEM PROFILES (1986)

<u>Study Area</u>	<u>System</u>	<u>Maximum Revenue Vehicles In Service</u>	<u>Annual Revenue Vehicle Miles (000s)</u>	<u>Annual Unlinked Rides (000s)</u>	<u>Unlinked Rides per VMT</u>
Atlanta	(MARTA)	604	25,521	85,257	3.3
Baltimore	(MTA)	723	20,294	101,529	5.0
Boston	(MBTA)	778	22,310	96,789	4.3
Chicago	(CTA)	1862	72,326	465,866	6.4
Cleveland	(RTA)	561	18,743	67,238	3.6
Dallas	(TS)	602	18,119	48,355	2.7
Denver	(RTD)	631	25,347	53,547	2.1
Detroit	(DOT)	571	21,099	72,369	3.4
Detroit	(SEMTA)	200	7,112	8,704	1.2
Houston	(MTA)	714	30,014	68,182	2.3
Los Angeles	(SCRTD)	2073	91,395	450,378	4.9
Miami	(DCTA)	420	17,999	59,650	3.3
Milwaukee	(MCTS)	484	17,284	75,230	4.4
Minneapolis	(MTC)	821	21,993	72,693	3.3
Newark	(NJT)	1621	66,260	135,598	2.0
New York City	(NYCTA)	3781	98,073	748,070	7.6
Philadelphia	(SEPTA)	1141	33,014	173,904	5.3
Pittsburgh	(PAT)	802	28,083	81,740	2.9
Portland	(MTD)	428	18,422	50,394	2.7
San Francisco	(Muni)	393	13,392	100,754	7.5
Seattle	(Metro)	841	25,578	61,323	2.4
St. Louis	(Bi-State)	637	19,950	52,386	2.6
Washington	(WMATA)	1380	38,416	170,757	4.4

SOURCE: U.S. Department of Transportation, National Urban Mass Transportation Statistics, 1986 Section 15 Annual Report, (UMTA-VA-06-0127-88-1), June 1988.

Table H-5

PEAK-HOUR SERVICE AND PASSENGER VOLUMES ON RAPID TRANSIT SYSTEMS
(One-Way In Peak Direction)

Study Area	Year	Line/Location	Trains per Hour	Cars per Hour	Persons per Hour	Passengers per Train (Rounded)	Passengers per Car (Rounded)
New York City	1982	IND E, F, 53rd St. Tunnel	26	208	54,500	2,100	260
		IND A, D, 8th Ave. Express	21	208	43,500	2,070	210
		IRT 4, 5, Lexington Ave. Exp.	25	250	38,100	1,520	150
		PATH-World Trade Center	38	266	27,500	720	100
Chicago	1984	Milwaukee	17	136	12,400	730	90
		Lake-Ryan	19	152	12,300	650	80
		North-South	15	120	11,400	760	95
Philadelphia	1976	Broad St. (2 tracks)	23	126	10,600	460	85
Boston	1985	Red Line	17	68	13,000	760	190
		Orange Line	15	60	9,000	600	150
San Francisco	1977	BART-Transbay	11	98	8,000	730	80
		BART-Mission	10	85	6,500	650	75
Washington	1980	Blue-Orange	20	120	13,000	650	110
Atlanta	1980	East Line	6	36	4,250	710	120
Cleveland	1976	West Side	14	52	5,400	390	105

Key to Notes

a -- Multiple track terminal.

SOURCE: Transportation Research Board, Highway Capacity Manual, Special Report 209, 1985 (p. 12-15); New York Metropolitan Transportation Council, Hub-Bound Travel, 1982, May 1984; Massachusetts Bay Transportation Authority.

Table H-6

PEAK-HOUR SERVICE AND PASSENGER VOLUMES ON STREETCAR AND LIGHT RAIL SYSTEMS
(One-Way In Peak Direction)

<u>Study Area</u>	<u>Location</u>	<u>Year</u>	<u>Trains per Hour</u>	<u>Cars per Hour</u>	<u>Persons per Hour</u>	<u>Passengers per Train</u>	<u>Passengers per Car</u>
<u>On Street</u>							
Pittsburgh	Smithfield St.	1976	51	51	3,800	74	74
San Francisco	Market Street (before subway)	1977	68	68	4,900	72	72
<u>In Tunnel or Off Street</u>							
Boston	Green Line -- Boylston	1985	45	85	10,600	235	125
	Green Line -- Lechmere	1985	12	12	1,600	135	135
Cleveland	Shaker Hts.	1976	30 ^a	60 ^a	4,400	143	73
Newark	City Subway	1978	30	30	1,500	50	50
Philadelphia	Market Street	1976	73	73	3,700	51	51
San Diego	LRT	1981	3	6	600	200	100
San Francisco	Market Street	1983	NA	62	6,340	109	102

Key to Notes

a -- Estimated.

SOURCE: Transportation Research Board, Highway Capacity Manual, Special Report 209, 1985 p. 12-16; Massachusetts Bay Transportation Authority.

Table H-7

PEAK-HOUR SERVICE AND PASSENGER VOLUMES FOR DOWNTOWN CIRCULATOR BUS SYSTEMS

<u>Study Area</u>	<u>Beginning Date</u>	<u>Number of Routes</u>	<u>Total Route Miles</u>	<u>Service Area Employment</u>	<u>Average Weekday Headways (Minutes)</u>	<u>Vehicles Operated in Peak Hour</u>	<u>Peak-Hour Ridership</u>	<u>Weekday Riders</u>	<u>Passengers per Hour (Average)</u>
Atlanta	May 1977	2	3.0	87,750	10	6	175	911	15
Boulder	---	1	~7.8	---	15	3	---	600	31
Dallas	---	1	2.6	65,773	6	5	304	2,500	42
Denver	---	4	7	---	17	10	485	2,080	30
Houston	1975	4(2) ^a	7.7	46,500	5	13	---	5,000	43
Kansas City	July 1972	2	5.6	51,428	~8	6	375	2,100	35
Los Angeles	Oct. 1971	1	8.4	200,000	5	14	850	4,500	44
Milwaukee	July 1975	1	3.2	---	6	7	---	2,800	66
Minneapolis	1971	1	2.4	100,000	9	---	---	1,800 ^b	54
San Antonio	---	1	1.8	29,483	5	5	860	5,600	120
St. Louis	1975	2	5	100,000	5	5	400	800-1,000	60
Washington	1972	1	7	128,000	6	12	1,200	2,500-3,000	41

Key to Notes

a -- Two at any one time of the day.

b -- Competing 10-cent buses following same route.

SOURCE: U.S. Department of Transportation et al., Planning for Downtown Circulation Systems, Volume I, Planning Concepts (UMTA-MA-06-0039-83-2), October 1983, p. 3-8.

MODE OF ACCESS: RAPID RAIL TRANSIT SYSTEMS
(In Percent)

Key to Notes

b -- Based on surveys from 6 A.M. to midnight.

b -- Based on surveys from 6 A.M. to midnight.

c -- Based on surveys from 6:00 A.M. to 3:00 P.M.

d -- Based on surveys from 6:30 A.M. to 9:30 A.M.

SOURCE: Reports from individual study areas.

Table H-9

ACCESS MODES TO RAPID RAIL TRANSIT TERMINALS AND STATIONS
(In Percent)

Study Area	Year	Terminal or Station	Boarding Passengers (Weekday)	Access Modes				
				Auto Drive	Auto Passenger ^a	Bus	Walk	Other
<u>Atlanta^d</u>								
Avondale	1985	Terminal	10,200	26 ^b	8	58	8 ^c	0
East Lake	1985	Station	3,500	37 ^b	9	43	11 ^c	0
Lakewood	1985	Terminal	15,900	25 ^b	5	69	1 ^c	0
Lenox	1985	Station	11,000	12 ^b	3	51	35 ^c	0
<u>Boston^e</u>								
Red Line								
Harvard	1978	Terminal	23,530	2	3	45	50	0
Fields Corner	1978	Station	4,710	3	3	31	59	4
N. Quincy	1978	Station	4,400	42	10	5	42	1
Quincy Center	1978	Terminal	9,400	27	14	33	26	0
Orange Line								
Oak Grove	1978	Terminal	2,240	37	16	22	24	1
Forest Hills	1978	Terminal	11,040	13	9	62	15	1
Blue Line								
Wonderland	1978	Terminal	2,540	69	13	12	5	1
<u>San Francisco^f</u>								
Concord	76-77	Terminal	4,550	45	32	11	---	12
Richmond	76-77	Terminal	1,510	28	22	24	---	26
Fremont	76-77	Terminal	3,440	51	25	18	---	6
Daly City	76-77	Terminal	8,080	22	34	31	---	13

Table continued on following page.

Table H-9 (Continued)

ACCESS MODES TO RAPID RAIL TRANSIT TERMINALS AND STATIONS
(In Percent)

Study Area	Year	Terminal or Station	Boarding Passengers (Weekday)	Access Modes				
				Auto Drive	Auto Passenger ^a	Bus	Walk	Other
<u>Washington^g</u>								
Addison Road	1984	Terminal	---	38	20	32	8	2
New Carrollton	1984	Terminal	---	47	27	20	2	4
Silver Spring	1984	Terminal	---	21	16	42	19	2
Van Ness - UDC	1984	Terminal	---	9	14	25	50	2
Ballston	1984	Terminal	---	17	12	52	18	1
Huntington	1984	Terminal	---	57	16	5	19	3

Key to Notes

- a -- Includes carpool and kiss/ride.
b -- Park/ride.
c -- Includes bicycle.
d -- Based on surveys conducted from 6:00 A.M. to 8:00 P.M.
e -- Based on surveys conducted from 6:00 A.M. to midnight
f -- Based on surveys conducted from 6:00 A.M. to 3:00 P.M.
g -- Based on surveys conducted from 6:30 A.M. to 9:30 P.M.

SOURCE: Bruce Emory, "Mode of Access to MARTA Stations," presented at the 1985 APTA Rapid Transit Conference, June 4, 1985; Michael Carakatsane and Lawrence Tittmore, MBTA Systemwide Passenger Data Collection Program Volume I: Rapid Transit System, CTPS Technical Report 26, April 1981; Washington Metropolitan Area Transit Authority; Alistair Sherret, BART's First Five Years: Transportation and Travel Impacts, DOT-P-30-79-08, April 1979.

Table H-10

RIDERSHIP STATISTICS FOR NEW RAIL AND DPM SYSTEMS
(Unlinked Trips)

Study Area	Time Period	Average Monthly Rides	Average Passengers per Weekday	Average Passengers per Weekend Day	Fare (\$)	Directional Route Miles (One-Way)	Number of Stations
People Mover							
Detroit	9/87-4/88	315,500	8-11,000	13,000	0.50	2.94	12 ^c
Miami	7/87-3/88	280,000	10-12,000	4-6,000	0.25	3.8 ^a	9
Rapid Rail							
Atlanta	7/87-2/88	5,457,000	220,000	90,000	0.75	57.9	27
Baltimore	3/88-6/88	1,200,000	50,000	28,000	0.90-1.45	28.	12
Miami	5/88	830,000	35,000	10,000	1.00	42.	20
Washington	7/87-3/88	11,162,000	450-490,000	140,000	0.80-2.40	139.	64
Light Rail							
Buffalo	1/88-7/88	680,000	29,000	9,000	0.00-0.80	12.8	14
Pittsburgh	7/87-6/88	682,000	27,000	11,000	1.00-1.25	45.0 ^b	60 ^b
Portland	1/88-4/88	550,000	19,000	15,000	0.00-1.35	30.2	27
Sacramento	1/88-6/88	312,000	13,000	3,000	1.00	36.6	26
San Diego	1/88-6/88	815,000	28,000	24,500	0.50-1.50	40.8	22
San Jose	7/88	155,000	6,000	3,500	0.75	17.8	17

Key to Notes

a -- Two-way guideway 1.9 miles long.

b -- Includes reconstructed Phase I system with 21 directional route miles and 36 stations.

c -- Cobo Hall, the 13th station, is scheduled to open in late 1988.

SOURCE: Reports from individual study areas.

I. HIGHWAY AND HOV USAGE STATISTICS

This section presents statistics on the usage characteristics of major highways and high-occupancy vehicle (HOV) facilities located on freeways. A key output of any demand modeling project is flows on the network. For comparative purposes, average daily traffic (ADT) and the percentage of ADT occurring in the peak hour (as measured at maximum load points) are presented for selected freeway facilities. For HOV sites, peak-hour volumes on the general-purpose and HOV lanes (by carpool and/or bus) are given as measured approximately one year after implementation and as most recently available (typically, for the years 1982-1985). Information is not presented here on changes in demand volumes due to the introduction of an HOV treatment, thus the statistics presented are most useful for comparison with other forecasts.

Table I-1

AVERAGE DAILY VEHICLE VOLUMES ON URBAN FREEWAYS AND EXPRESSWAYS
(Maximum Load Points)

Study Area	1980 Urbanized Area Population (000s)	Facility	Lanes	Year	Average Daily Traffic (2-Way)
Atlanta, GA	1,613	I-75	8	1984	146,050
Boston, MA	2,679	I-93 (Central Artery)	6-8	1981	147,800
Chicago, IL	6,780	I-90/94 (Dan Ryan)	12	1984	248,000
Cleveland, OH	1,752	I-90	8	1972	94,000
Dallas, TX	2,451	I-35	6-10	1978	217,700
Denver, CO	1,352	I-70	6	1984	114,000
Detroit, MI	3,809	M-10 (Lodge)	6	1981	111,450
Houston, TX	2,412	I-610 (E. of Main)	8	1984	169,000
Kansas City, MO	1,098	I-70	8	1985	109,500
Los Angeles, CA	9,479	I-10 (Santa Monica)	10-14	1975	243,000
Miami, FL	1,608	I-95	8	1975	169,000
Milwaukee, WI	1,207	I-94 (N-S Freeway)	8	1984	118,000
New Orleans, LA	1,078	I-10	7	1984	187,600
New York, NY	15,590	George Washington Bridge	14	1984	249,300
Pittsburgh, PA	1,810	I-279	8	1986	90,000
San Diego, CA	1,704	I-5	12	1975	161,000
San Francisco, CA	3,191	S.F. - Oakland Bay Bridge	10	1984	223,000
San Jose, CA	1,244	U.S. 101 (Nimitz Freeway)	6-8	1973	101,000
Seattle, WA	1,392	I-5	12	1985	224,000
Tampa, FL	521	I-275	6	1984	132,750
Washington, DC	2,763	I-95	8+	1975	143,000

SOURCE: Traffic volume counts for each urban area.

Table I-2

DAILY AND PEAK-HOUR VEHICLE VOLUMES ON URBAN FREEWAYS AND EXPRESSWAYS

Study Area and 1980 Urbanized Area Population	Facility	No. of Lanes	Year ^a	Average Daily Traffic (2-Way)	Peak-Hour Volumes in Peak Direction	
					Vehicles (One-Way)	% of 2-Way ADT
Atlanta, GA 1,613,000	I-20 E. of CBD @ Moreland Ave.	8	1984	99,900	7,794	7.8
	I-20 @ Martin Luther King Jr. Drive	8	1984	91,200	---	5.7 (1975)
	I-75 S. of CBD @ University Ave.	8	1984	146,050	---	5.6 (1975)
	I-75 N. of CBD (N. of I-85)	8	1984	82,830	---	6.2 (1975)
	I-85 N. of I-75 @ Monroe Dr.	8	1984	95,300	6,765	7.1
Boston, MA 2,679,000	I-93 N. of I-495	6	1984	76,500	5,200	6.8
	S.E. Expwy. @ Southampton St.	6-8	1982	143,300	6,860	4.8
	I-95 -- East of 128 N. of Middlesex	8	1984	125,050	7,282	5.8
	I-55 -- Stevenson Exp. E. @ California Lake Shore Dr. @ Aldine	6	1984	135,300	---	---
Chicago, IL 6,780,000	I-25 South of I-70	8	1984	175,000	7,500	4.3
	I-70 btw. Colorado Blvd. & Dahlia	6	1984	114,000	4,650	4.1
	US 6 West of Federal Blvd.	6	1985	112,000	5,835	5.2

Table continued on following page.

Table I-2 (Continued)

DAILY AND PEAK-HOUR VEHICLE VOLUMES ON URBAN FREEWAYS AND EXPRESSWAYS

Study Area and 1980 Urbanized Area Population	Facility	No. of Lanes	Year ^a	Average Daily Traffic (2-Way)	Peak-Hour Volumes in Peak Direction	
					Vehicles (One-Way)	% of 2-Way ADT
Detroit, MI 3,809,000	Ford Fwy. (I-94) @ Chrysler Fwy.	6	1978	101,100	4,800	4.7
	Jeffers Fwy. (I-96) & Warren	8	1980	67,600	6,270	9.3
	Lodge @ East Grand Blvd.	6	1981	111,450	4,660	4.2
Houston, TX 2,412,000	I-45 - Gulf @ Velasco	8	1976	156,500	5,610	4.2
	I-45 - North, S. of North loop	8	1976	121,900	7,420	6.0
	US 59 - S.W. @ Montrose	10	1976	145,900	8,470	5.8
	US 59 - S.W. & Rice Ave.	8	1976	162,700	6,730	4.1
	I-10 - East of Taylor St.	10	1985	151,000	7,600	5.0
	I-10 - East of McCarty	8	1985	110,200	7,530	6.8
	I-610 - @ Ship Channel	10	1985	103,200	5,540	5.4

Table continued on following page.

Table I-2 (Continued)

DAILY AND PEAK-HOUR VEHICLE VOLUMES ON URBAN FREEWAYS AND EXPRESSWAYS

Study Area and 1980 Urbanized Area Population	Facility	No. of Lanes	Year ^a	Average Daily Traffic (2-Way)	Peak-Hour Volumes in Peak Direction	
					Vehicles (One-Way)	% of 2-Way ADT
Milwaukee, WI 1,207,000	N-S Fwy @ Wisconsin	8	1984	118,080	5,370	4.5
	N-S Fwy @ Greenfield	8	1984	110,050	6,380	5.8
	E-W Fwy @ 26th St.	6	1984	121,150	5,700	4.7
	Zoo Fwy @ Wisconsin	6	1984	110,730	4,760	4.3
	Airport Fwy @ 68th	6	1984	81,020	3,940	4.9
New York City, NY 15,590,000	Long Island Expwy	6	1984	157,300	---	3.2 (1973)
	FDR Drive	6	1982	142,000	4,350	3.1
	Holland Tunnel	4	1982	73,200	2,700	3.7
	Lincoln Tunnel	6	1982	110,700	5,150	4.7
	Brooklyn-Battery Tunnel	4	1982	52,900	3,650	6.9
San Francisco, CA 3,191,000	Oakland-Bay Bridge (I-80)	10	1984	223,000	8,898	4.0
	James Lick Fwy (U.S. 101)	8	1978	140,000 ^b	6,690	4.8
	Southern Fwy (I-280)	8	1978	96,050	6,500	6.8
	Golden Gate Bridge (U.S. 101)	6	1979	90,540	6,020	6.6

Table continued on following page.

Table I-2 (Continued)

DAILY AND PEAK-HOUR VEHICLE VOLUMES ON URBAN FREEWAYS AND EXPRESSWAYS

Study Area and 1980 Urbanized Area Population	Facility	No. of Lanes	Year ^a	Average Daily Traffic (2-Way)	Peak-Hour Volumes in Peak Direction Vehicles % of	
					(One-Way)	2-Way ADT
Washington, DC 2,763,000	Shirley Hwy (N. of 4 Mile River)	8	1975	136,000	8,010	5.2
	I-95 Bridge (Over Potomac)	8	1975	142,700	6,260	4.4
	Theodore Roosevelt Bridge	6	1984	86,200	---	8.6 (1975)
	Anacostia Fwy (Howard Road)	6	1984	121,700	---	5.0 (1975)

Key to Notes

a -- Year in which counts were taken.

b -- Estimate.

SOURCE: Reports from individual study areas.

Table I-3

PEAK-HOUR VOLUMES ON HOV FREEWAY FACILITIES APPROXIMATELY ONE YEAR AFTER IMPLEMENTATION

Study Area	HOV Facility	HOV Priority Strategy	Year After Implementation	Peak-Hour Volumes (Inbound)			
				Nonpriority Auto Volume (VPH)	Priority Auto Volume (VPH)	Priority Bus Volume (PPH)	HOV Bus Volume (BPH)
Boston	Southeast Expressway	Bus Only	1971	4,201	NPA ^a	2,454	65
Boston	Southeast Expressway	Buses/3+ Carpools	1977	4,306	641	2,124	54
Los Angeles	San Bernardino	Bus Only	1973	7,300	NPA	1,017	45
Los Angeles	San Bernardino	Buses/3+ Carpools	1977	7,277	576	2,708	81
Miami	I-95	Buses/3+ Carpools	1976	6,416	309	314	10
Miami	I-95	Buses/2+ Carpools	1977	5,880	1,357/246 ^b	352	10
New York City	Lincoln Tunnel, I-495	Bus Only	1971	3,227	NPA	26,092	597
Portland	Banfield Freeway	Buses/3+ Carpools	1977	3,845	180	570	20
Portland	Banfield Freeway	Buses/2+ Carpools	1980	3,793	1107/163 ^b	657	22
San Francisco	U.S. 101	Bus Only	1975	5,330	NPA	3,572	94
San Francisco	U.S. 101	Buses/3+ Carpools	1976	5,333	288	3,686	97
Washington, DC	Shirley Highway	Buses/4+ Carpools	1974	5,126	758	8,756	194

Key to Notes

a -- No priority autos (NPA) included in HOV treatment.

b -- Two occupant/three occupant carpools.

SOURCE: Charles River Associates, Predicting Travel Volumes For HOV Priority Techniques: Technical Report, prepared for the Federal Highway Administration (FHWA/RD-82/043), April 1982.

Table I-4

PEAK-HOUR PERSON VOLUMES AND VEHICLE OCCUPANCIES ON FREEWAY HOV FACILITIES

Study Area	HOV Facility	HOV Priority Strategy	Year	Person Volumes per Lane (Peak Hour)				Peak-Hour Vehicle Occupancy		
				General Lanes	HOV Lanes		All ^a	General Lanes	HOV	
					Bus	Carpool/ Vanpool			Carpool/ Vanpool	
Houston	I-45N	Bus/8+ Vanpool	1982	2,400	1,300	2,830	4,130	1.21		12.3
Houston	Katy Freeway (I-10)	Bus/4+ Carpool	1984	1,918	1,020	745	1,765	1.16		10.9
Los Angeles	San Bernardino (I-10)	Bus/3+ Carpool	1984	2,588	3,450	2,855	6,490	1.22		3.15
Miami	I-95	Bus/2+ Carpool	1984	2,162	700	3,005	3,705	1.20		1.51
Miami ^b	U.S. 1	Bus/2+ Carpool	1984	1,470	600	2,416	3,016	1.08		2.17
Portland	Banfield Freeway	Bus/3+ Carpool	1977	2,272	570	505	1,075	1.18		2.81
San Francisco	U.S. 101	Bus/3+ Carpool	1984	2,865	2,910	1,315	4,235	1.50		3.70
Santa Clara	U.S. 237	Bus/2+ Carpool	1984	1,513	160	1,705	1,950	1.00		2.15
Seattle	I-5	Bus/3+ Carpool	1985	2,311	1,800	1,490	3,290	1.20		3.75
Washington, DC	Shirley Highway (I-395)	Bus/4+ Carppol	1985	2,400	3,672	4,942	8,614	1.34		5.06
Washington, DC	I-66	Bus/3+ Carpool	1984	---	374	2,577	2,951	---		2.17

Key to Notes

a -- "All" includes bus, carpool/vanpool, and violators.

b -- Urban arterial.

SOURCE: Frank Southworth and Fred Westbrook, Study of Current and Planned High Occupancy Vehicle Land Use: Performance and Prospects, Oak Ridge National Laboratory (TM-9847), December 1985.

Table I-5

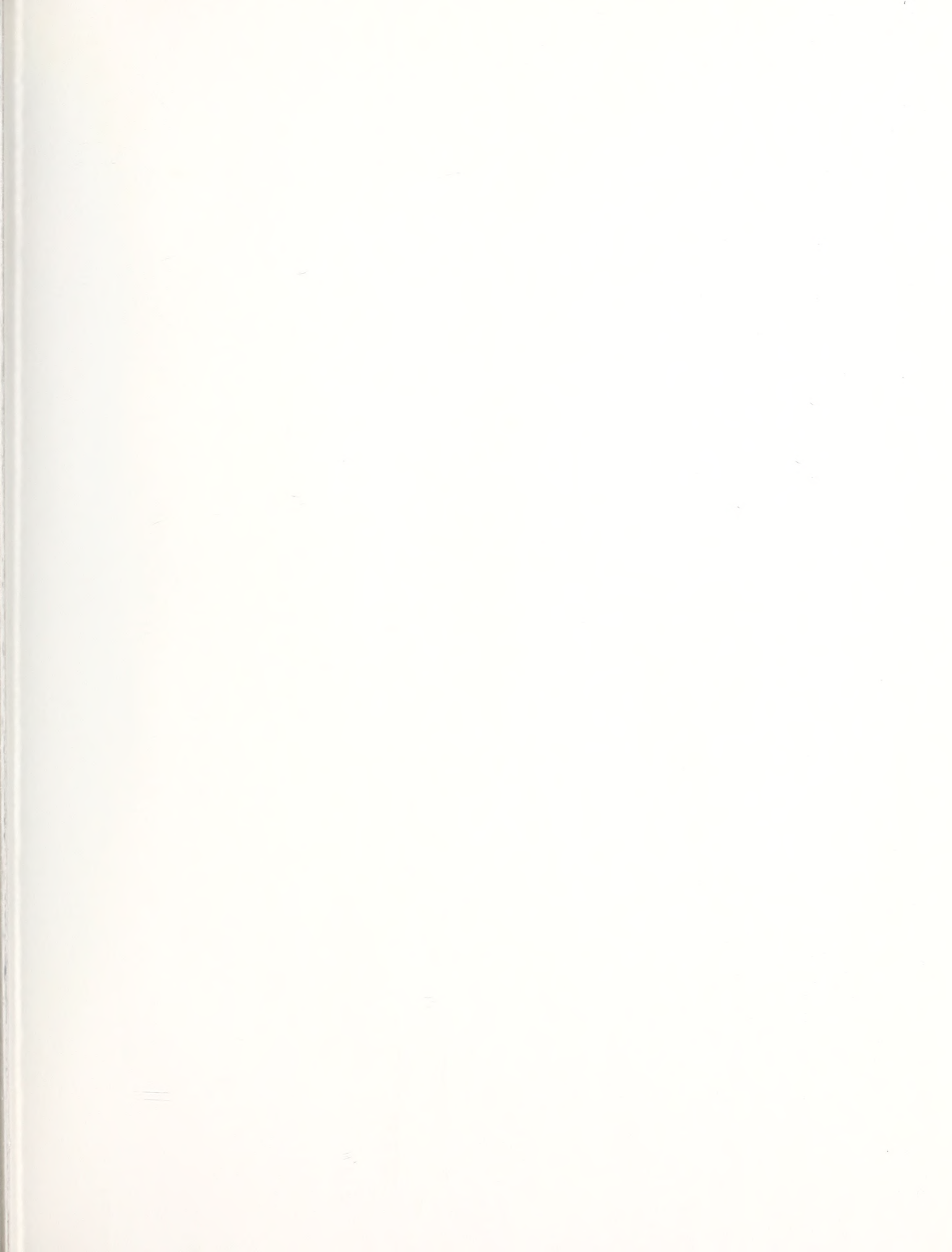
DAILY AND PEAK-HOUR PERSON VOLUMES ON TRANSITWAYS/HOV FACILITIES
(Includes bus and carpools/vanpools where applicable)

Study Area	HOV Facility	Year	Date Implemented	Transitway Passengers	
				Peak Hour Peak Direction	Daily ^b (Two-Way)
Houston	I-45N	a	1979	4,055	14,000
Houston	Katy Freeway (I-10)	a	1984	4,114	15,900
Los Angeles	San Bernardino (I-10)	a	1973	6,400 ^c	43,000
Los Angeles	SR 91	a	1985	2,700	13,200
Miami	I-95	a	1976	2,810	---
Orange Co., CA	SR 55	a	1985	3,900	52,400 ^d
Pittsburgh	East (MLK, Jr.) Busway	a	1983	5,590	28,500
Pittsburgh	South Busway	a	1977	2,950	18,000
New York	Lincoln Tunnel (I-495)	a	1970	34,685	65,600 ^e
San Francisco	Bay Bridge	a	1970	17,170	54,050
San Francisco	Marin Co. (U.S. 101)	a	1974	3,260	13,850
San Francisco	Santa Clara (SR 237)	a	1984	2,170	12,870
San Francisco	South Bay (U.S. 101)	a	1986	2,010	9,920
Seattle	I-5	a	1983	3,290	---
Seattle	SR 520	a	1975	2,366	---
Washington, DC	Shirley Highway (I-395)	a	1969	17,260	63,486
Washington, DC	I-66	a	1982	11,260	31,720

Key to Notes

- a -- Circa 1985-1986.
b -- Some facilities operate over limited hours.
c -- Revised from source document.
d -- Operates 24 hours per day.
e -- AM peak period only.

SOURCE: American Public Transit Association, Transitways, October 1987.



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